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Electrical World

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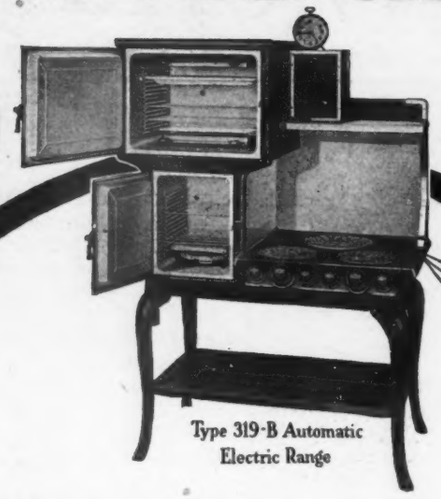

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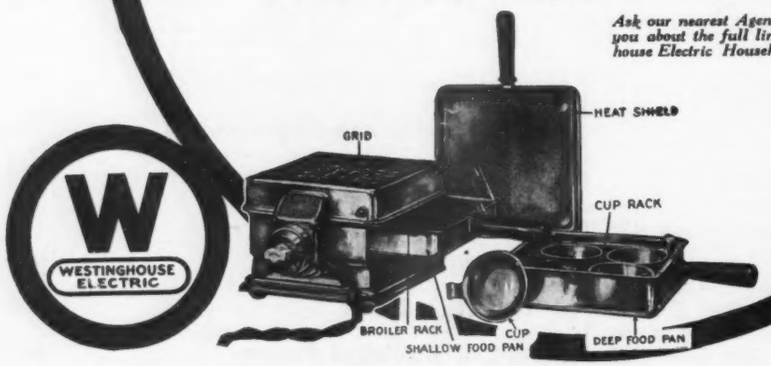

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Electrical World

The consolidation of ELECTRICAL WORLD, ELECTRICAL ENGINEER *and* AMERICAN ELECTRICIAN

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The World Unshackled

VICTORY has come to our armies and our ideals. The war against oppression and autocracy has been fought and won. It is well that we should shout and give full sway to our emotions, that we should glory in the result with exultation and great joy. But after the hoarseness has passed away and our ears have become attuned once more to normal sounds we should face the great problems of reconstruction and peace resolutely, soberly and patriotically. The world has been out of joint for so long that it will require all the skill that we possess to set it right again. There are governments to form, cities to build, wounds to heal and people to feed and clothe over there, while over here there are adjustments to make, labor to satisfy, industry to encourage, foreign trade to develop and returning soldiers to employ. Engineering skill devised the weapons of destruction, and the same skill can be employed to rear a better and more habitable abiding place out of the ruins. We have fought for ideals and conquered; let us now turn to their practical application.

The signing of the armistice Monday morning marks an epoch in history which will loom larger as the years pass by. We who have lived through the dark fifty months in which the very roots of civilization were threatened cannot yet realize how great is the day now dawning. We may well be proud of the splendid part which the United States, coming late on the stage, has played in the terrible drama. We can never forget that it was upon the rock of the American defense at Château-Thierry that the high water of the last great wave of Teutonic effort broke; yet we should be ungrateful indeed did we not remember the magnificent work which the American engineering forces did in the grim months that went before, and must still do, until the Rogues' March rings out over the unhallowed grave of ruthless autocracy. Their work in preparing the way for the great American field armies has not yet half been told, and they have been as ready with rifle as with axe and spade, for American engineers formed part of the forlorn hope, hastily gathered together, that stopped the gap in the Allied lines until Marshal Foch's reinforcements turned the tide.

The engineers have been in the forefront of the fighting, have built roads and railways under fire in the shell-torn fields, bridges in the face of hostile machine guns, and have followed the advance, building and fighting by turns, until the hour of victory. Nor is their work done, for in the tremendous task of reconstruction theirs will still be a conspicuous part. Save for the little force of regulars and marines sent over to carry the guidon of hope they were first in the field, and save for the Medical Corps they will probably be the last to leave. To those who return all honor is due: to those who have died on the field of glory no tribute is too high.

Unlike prophets, engineers are seemingly not without honor in their own country. Municipalities have named streets after their illustrious dead; but it remained for the Pacific Coast to call power houses after pioneers, engineers and designing geniuses, such as De Sabla, Drum and Wise. Now the government itself has added a hydroelectric plant in the Yosemite Valley and dedicated it to the memory of the late Henry Floy. What more fitting monument can an engineer ask?

Government Operation After the War

GOVERNMENT control of operation of the railroads, the telephone and the telegraph systems was intended to be essentially a war emergency measure. It was so recognized by Congress in the enabling legislation; it was so accepted by the responsible members of the President's Cabinet who are now administering these properties in connection with their regular duties. Under the act of Congress transferring control of the carriers to the government this status holds for twenty-two months after official declaration of peace. The control of the communication agencies lasts until formal ratification of peace. Unless, therefore, Congress should enact new legislation restoring these properties to their owners at an earlier day there will be a substantial interval during which the government departments will continue to operate them.

During the period, barely over, when the heightened activities of the nation were directed toward the one aim of righteous victory in the war every other public issue sank to relative insignificance. The Washington authorities let Congress and the country know that they felt that complete authority over railroad and wire communication facilities was essential to their successful conduct of the war, and promptly they were given what they asked. They have had the full benefit of the organization built up by the companies; they have had the loyalty which every good citizen gives unhesitatingly in the hour of his country's need in a right cause. In due time they will render to the public, by whose will they hold office, and to the owners and creditors whose properties they are managing a full account of their stewardship. From the fact that government control is to last so long after actual hostilities (unless Congress should decide otherwise) it is evident

that the authorities will have abundant opportunity to try their hand under the simpler normal conditions of peace as well as under the feverish acceleration of war.

Efficiency is a question of management, of coöperation between forces. With the railroads the crucial test of efficiency under government operation centers on the thoroughness of coördination of all of the trackage, the motive power and the rolling stock and the economies thereby realized. Such coördination, to be really successful, should mean operation with better service for the same cost, operation with the same service for less cost, or operation with both better service and less cost than the railways operating independently of each other were able to or could achieve. It is less easy to point to the basic test of the value of government operation of communication lines, for the larger telephone facilities of the country were effectively welded into one harmonious whole under able private management. The telegraph facilities of course involved the element of competition between companies. Service and cost are, however, the determining factors.

As a fundamental national policy is involved it must be anticipated that the results of operation—financial, physical, public—of all of the properties put under government direction as a step in the mobilization of the national resources for war will be subjected to the closest scrutiny. If the problem is faced as an economic one, certainly politics merely for the sake of political advantage can have no just place in the consideration of this policy, personal ambitions or prejudices are unworthy elements, predetermined convictions as such are not valid evidence; it is what the facts reveal of success or failure under actual experience that is most likely to influence the future course of the country.

Whether there is or is not a shortage of electric power in the Philadelphia district is a determinable fact. In fairness and justice to the public utility, the city and the national government, this fact should be established by competent and unbiased authority and the controversy over the question ended. Crimination and recrimination ought not to be tolerated in the City of Brotherly Love.

An Engineer Defined

IN THE midst of the chaos of war engineers have been striving to establish professional order and system. The director of engineering for the United States Employment Service at Chicago has just braved tradition by defining anew the term "engineer." He offers for popular use a definition that is compact and apparently practicable: "An engineer is one who economically directs man power and by scientific design utilizes the forces and materials of nature for the benefit of mankind." In view of the confusion which exists as to the exact meaning of the term "engineer" and the attendant industrial and economic losses entailed by such confusion, the appearance of the new definition must be regarded as important. At any rate, it has the government's stamp of approval, and if it combines the scientific, artistic and professional ideals of the engineer, it deserves to stand.

Electrifying a State

IT IS very seldom that a deliberate effort is made to cover a large territory with a network for electrical transmission. Great systems as a rule do not grow up in an orderly way. They result from the pressure of necessity in linking together transmissions organized and developed independently. The time finally comes when united effort is desirable, and then by a similar process still other plants are linked to the growing system until a great stretch of territory is actually covered. A very excellent example of this process of growth is given in the account of the Connecticut transmission network, of which we present a map showing its present state. A glance shows that an immense deal has been accomplished, while still more remains to be done in the line of unification. The mode of development has left much to be desired in the matter of standard voltages. At present there is everything from low-voltage tie lines up to 66,000 volts, and sooner or later a voltage standard is due to arrive.

Connecticut transmission systems have their origin in the enterprise of the late A. C. Dunham of the Hartford Electric Light Company. That company grew and prospered and has become one of the very large utilities of the state. The United Illuminating Company, operating at Bridgeport and New Haven, is another important factor. The Connecticut Power Company, working from its hydroelectric plants in the northwestern highlands of the state, operates the only 66,000-volt transmission of the group. The Connecticut Light & Power Company in New Britain and Waterbury and the Shore Line Electric Railway Company make up the other chief elements, added to which are the distinctly electric railway systems of the Connecticut Company and the New York, New Haven & Hartford Railroad. These two last-mentioned plants are chiefly confined to their own particular work. In the northeastern section of the state a line crosses into Massachusetts and connects with the great system of the New England Power Company, while not far to the westward a connection from the Turners Falls Power & Electric Company reaches across the Connecticut line but is not yet tied in with the other systems. On the extreme east of the state is a connection with the Narragansett Electric Lighting Company of Providence, itself tied in with the New England Power Company to the northward.

A glance at the map shows the completeness of the linkage in the central part of the state, its wide ramifications to east and west and the places marked out by fate for further interconnection. The whole story is yet far from being told. The ultimate result must inevitably be further extension of the various lines into final electrical unity, enabling power to be passed around along the lines where it is most needed. This will imply extensions here and there, the tying together of existing lines at numerous places through frequency changers if need be, to take proper account of the railway plants, and finally a gradual standardization of the transmission voltages. The long main lines will work toward 66,000 volts; the lesser ones are likely ultimately to settle on a third or a half of this figure. There is no very general agreement as to the medium voltages most desirable to employ, while the higher ones are fairly well standardized. Voltage changes can be, and probably will be, made gradually, because it involves no

great inconvenience to tie in through transformers of the necessary ratio, which sometimes serve a useful purpose as electrodynamic buffers in the distribution. It is a very instructive thing to look over the wealth of accomplishment thus shown in a single state and to speculate on how the whole network might look could it have been, with further foresight than is the common lot, developed from the start as a state-wide distributing network.

Small generating systems have more to gain through interconnection than many large central stations. In fact, the proverb "In union there is strength" is especially applicable to them. Super-stations, like strong nations, can usually stand alone. It is the weaker nations that seek alliances and support from their neighbors, and the added reliability of service secured by a tie line is of itself sufficient justification for the expense of joining two small stations together.

Treating Globes for Discoloration

THE brief paper by Alfred Herz in the current issue is of much more than passing interest since it involves, not cleansing in the ordinary sense, but remedial measures applied to a very curious result of ultra-violet radiation which happens to be of considerable importance in practice. This effect is the familiar discoloration of arc-lamp globes, especially those used on magnetite arcs, during service, resulting in a dull purplish tinge which is both objectionable in appearance and injurious to the light-transmitting power of the glass. Mr. Herz points out quite correctly the general conditions and their causes. All common glass is likely to be greenish owing to the presence of iron in the sand from which it is made. This iron has no useful function whatever and is tolerated in the glass simply because it is extremely difficult to find sand not discolored with iron, or white silica in any other form at any reasonable expense, so far at least as the coarser grades of glass are concerned. It has therefore been the practice for a long time past to correct or rather disguise this green coloration by the addition of manganese. Possibly Mr. Herz creates a slightly false impression by referring to the result as a thin black cloud. Generally speaking, there is no appearance of this kind perceptible, but the transmission coefficient of the glass is nevertheless reduced precisely as explained.

What actually happens is that the iron results in absorption in the green, to balance which more absorption is effected in the red and blue by the addition of the manganese. The glass appears perfectly clear, but slightly dull as compared with, for instance, a brilliantly clear piece of optical crown made in the first place from uncontaminated silica. Just how ultra-violet radiation acts upon the constituents of the glass is not fully understood, but it does bring out a perceptible discoloration such as that which might be produced by the manganese alone; in other words, it far over-compensates the green of the iron. This phenomenon is probably due to wave lengths less than about 310 μμ. The magnetite-arc lamp, the commonest source of this discoloration, is very rich in such rays; the carbon arc, from which these effects were rarely obtained, is much less strong in this region, while sunlight is extremely weak here and produces the characteristic purplish color only after exposure under favorable conditions for many years. The discovery noted by Mr. Herz—heat treatment at 900 deg. to 1000 deg. C.—which removes this discoloration and restores the manganese compound to its original balance, is from a practical standpoint extremely important, for it saves otherwise perfectly good globes for a long-continued useful life. It seems likely that the discoloration is the more marked as the percentage of manganese added in compensation increases, and that some globes of recent manufacture are probably more susceptible to this sort of action than globes made when white sand was more easily obtainable. The whole story is a beautiful example of a peculiarly occult photo-chemical action and its reversal by a very simple and inexpensive heat treatment.

Experience seems to have sobered some of the leading men of the industry into that caution which is the parent of inaction. Receptiveness to new ideas and a welcome enthusiasm have ever been leading attributes of electrical men, and it is a tragic spectacle to witness how reluctantly some men adapt themselves to changed conditions. If materials are not to be had, substitutes ought to be found. Routine often prevents the exercise of that thought so essential to economy and progress.

Inspecting Electric Welds

THE rapidly increasing use of electric welding for all purposes is a striking recent development of engineering. In particular, the extensive use of welded joints in larger structural work promises to be of great importance. A welded joint when well made is extremely strong and reliable, but faults such as those which may be due to improper fusion, slag, porosity and crystallization are not obvious on the surface and make the inspection of such a joint a far more difficult matter, for example, than the critical examination of a riveted joint.

Among the various methods of inspecting them, O. S. Escholz in a recent article lays stress on careful visual examination backed up by chipping and calking trials as far as they can conveniently be applied, but he chiefly relies on the penetration tests with liquids. X-rays when very carefully worked give a good deal of valuable information, particularly on thin plates, but they are rather troublesome both to make and interpret. Tests of gas penetration are not easy to accomplish, but the liquid test appears to be a very easy and effective one, kerosene being the favorite medium, advantageously colored by oil soluble dyes. The oil goes rapidly into any capillary openings, and unless the weld is complete will almost invariably penetrate and stain the plate on the opposite side. Of course, isolated slag pockets or cavities cannot be run down in this simple way, which, however, gives in ordinary cases a most valuable and simple test of the perfection of the joint. Of the electrical tests Mr. Escholz has a rather poor opinion, owing to the extreme difficulty of conducting them which arises from the intrinsic difficulties of the experiments.

TO MEET THE LARGE REQUIREMENTS OF THE RECONSTRUCTION ERA, LABOR AND CAPITAL WILL HAVE TO CO-OPERATE WISELY

Electrical Industry in Reconstruction

Peace Means New Opportunities for Service in Different Branches of the Industry—Factors of Labor, Capital, Raw Materials and Markets, and Possibilities of Changes

WAR time has been a time of strain and trial in the different branches of the electrical industry, and peace is welcomed for business reasons after the glad rejoicing for humanitarian reasons. The essential characteristic of the industry as a whole is its steady progress under all conditions which can be expected to prevail normally, and the restoration of that predominant trait is confidently anticipated for the central stations with the return of peace and a settled status.

Whether or not there is to be an extended interval of uncertainty or serious hesitation time will give the best answer; but even in such an intermediate period electric service will be as indispensable as ever for light and power. Certainly the need that the world shall be reclothed and fed and otherwise generally provided for and given the opportunity to rebuild is a very keen one, reaching all quarters of the globe, and the orderly maintenance of industrial processes is required so that this end may be attained without social upheaval. Electric service has the adaptability that makes it the invaluable servant of all, and its power will energize the mighty forces of peace and reconstruction as it has skillfully accelerated those of war. No industry was more ready on the instant call to arms to divert its great strength of organization to the national interest; none is more ready to meet the new requirements which will come with peace. Even though this nation appears to lack the comprehensive governmental program which other countries have formulated for after-war problems, the central stations will fortunately be able to serve customers because their product is the same in all seasons and under all conditions.

What will be changed now or soon is the basic details of the system by which the service is furnished. There are four factors to deal with—labor, capital, raw materials, markets. With the first four of these the problem in all branches of the industry has been twofold, relating to both scarcity and cost. There has been no trouble about markets; the difficulty in most communities and companies was to produce enough energy and goods to meet the vociferous demands of customers. Freedom of markets has, however, been restricted somewhat by the war needs of the nation. Under the question of markets may also be placed the problems of rates or prices. That revisions are certain in these factors and in the resultant effect upon the various classes of properties in the electrical industry is as plain as that daylight follows the darkness of night.

Taking the central station as the accepted main barometer of the industry, the dispenser of the great volume of production whose steady increase means activity in all other branches, it can be seen that peace brings relief from heavy operating and managerial burdens. For the first time in the general history of the industry as a whole, the productive capacity of the central stations has been inadequate. And the companies, finding shortage of power supply imminent, have had to suspend solicitation of contracts, have abandoned or curtailed extensions, have in some cases given up their new-business departments altogether.

The war demand for power was greater than any peace-time demand since the industry was started. Never before this experience had the industry failed to anticipate with reasonable accuracy the development of the business of the communities about a year in advance. Not only did the urgent need for power for munitions and other national purposes call for new high levels of production, but the companies were also confronted by the fact that apparatus was scarce and carried an oppressive but inevitable war-time cost. Furthermore, they had to meet the condition that the

government, having of course the first right to all manufacturing resources, had to divert those resources to the production of what it deemed to be in the paramount national interest and therefore purely local considerations had to be ignored. Under the conditions now developing the companies will be able to get apparatus and supplies to meet necessary requirements of expansion. Prices will be subject to readjustment as the world-wide economic situation justifies, lessened to some extent possibly by arbitrary price-fixing by the government.

The history of all commodity price movements teaches that after so great an advance as has been seen, stimulated by the stupendous needs of war machines, an inevitable reaction occurs. After so long a period as four years of high prices, however, some of the elements of high cost tend to become permanently stabilized, and in these circumstances, although some natural reaction takes place, it is less likely to go so far as to restore the old level. Without regard to the price level, it is evident that after the unparalleled destruction of property the entire world wants all possible mechanical helps to production. Since in the last analysis the human influence is definitely turned always to constructive policy, it cannot be doubted that the great needs which are to be filled will mean large-scale production in time. Whether that time is immediately or after the nations measure accurately the size of the stupendous task of reconstruction, this country is so vast in terms of raw materials and manufacturing resources that it is capable of continuing to render as fine service to a world recuperating from the wounds of war as it did by throwing its weight on the side of right and for humanity's welfare in the contest itself. We stand on the threshold of an era when apparatus, supplies, goods are insistently needed, although the price will have to be in keeping with the general level of commodity costs.

Having doubled their output in four years, having demonstrated to the public, to the authorities, to European engineers that their fundamental economic base of mass production is sound and still has enormous possibilities in application, the electric central stations are in excellent position to progress with the requirements of the industries which they serve. They will have to obtain capital, however, and if the drafts upon the world investment capital for war are found to have made funds too scarce and oppressively high in cost, they will welcome some form of government allocation of available money. Certainly their needs for legitimate community expansion, in view of their proved conservation of fuel and man power, are entitled to rank above indiscriminate uses of capital for purposes not directly connected with the real word requirements.

With attention centered on our uneconomic policy of recklessly spending coal reserves and wasting water-power supply, it can reasonably be forecast that hydroelectric development will be one of the significant features of the new era in the electrical industry. This development has long been retarded, but now the revelations of the war have shown the public of the folly of wasting resources.

Preparations of Manufacturers

BY A. W. BERRESFORD
President Associated Manufacturers of Electrical Supplies

POST-WAR problems are so enormous in possibilities and so varied in character that it is doubtful if they can be properly estimated. Certainly the making of definite plans or even attempting to prescribe future lines of effort would be futile at the moment, and it is distinctly to be regretted that up to the present no national arrangements have been completed for at least a study and general statement of these problems.

Some encouragement may be found, however, in the fact that certain matters of current interest and effort must be of value for the future whatever it may bring. The cordial coöperation of the various sections of the Associated Manufacturers of Electrical Supplies in the war service groups looking to conservation has resulted in a standardization, a reduction of duplication and a clearing of the lines of obsolete or obsolescent types which must produce an increased output and economy of manufacture that will put the industry on the best possible basis to deal with whatever may arise. Much had been done along these lines before our entrance into the war, but the pressure of the War Industries Board has greatly stimulated the process.

A further feature is the intelligent study of conditions of international trade which is being ably carried forward by our international trade committee under the chairmanship of J. J. Gibson. As originally constituted the function of this committee was the study of tariff matters, and this work is now being carried on under expert supervision and with the intent that when the time comes and its conclusions are placed before the Tariff Commission the needs of the industry will be presented in such manner as will insure intelligent appreciation and full consideration. It early became evident, however, that the matter of tariff was too closely bound up in questions of international trade to permit of its being considered without reference thereto, and the scope of the committee's work was correspondingly broadened.

These are but two instances, but the policy of the association will be to watch from day to day for the individual propositions which must be of advantage to its membership, whatever course the future may take, and to develop and perfect such propositions, confident that in the long run they must fit into the general scheme as experience evolves it.

Transmission Systems of Connecticut

Interconnection of Electric Utility Lines, Especially in the Industrial Territory of the State, Constitutes an Important Factor in the Conservation of Fuel—Description of the Work Completed and in Process of Construction

INTERCONNECTION of electric utility systems in Connecticut has reached an advanced stage, as the accompanying map indicates. Exclusive of the plants of the New York, New Haven & Hartford Railroad, the Connecticut Company and the Shore Line Electric Railway, the public utility stations in the state have a total rating of about 192,500 kw. and generate about 445,416,000 kw.-hr. per year. The individual stations range from 70 kw. to 36,000 kw. in capacity, and, including the railway plants of the companies above named, the total generating capacity of the utility plants in Connecticut is 252,500 kw. These figures include both steam and hydroelectric stations, although the former produce by far the greater part of the annual output. Through the tying together of systems in the central portion of the state and the interconnection of other properties lying along the border of Long Island Sound and extending into the northeastern area, reliability and efficiency of electrical production and distribution are being realized in an increasing degree. While much remains to be accomplished in extending the interconnection program, the existing development covers a large part of the industrial territory of the State and is an important factor in the conservation of fuel.

All the electric utility plants in the state were visited recently by E. Irvine Rudd, engineer, and A. E. Knowlton, power and illumination expert, of the Public Utilities Commission of the State of Connecticut, and they have compiled data as to the existing generating facilities, outputs, transmission systems, etc., and prepared the map upon which the accompanying illustration was based. The field work of this general inventory took over three weeks, and the information obtained will be of value to the Public Utilities Commission and to the Fuel Administration, besides giving a comprehensive idea of the state's electrical resources as at present developed. The ELECTRICAL WORLD is much indebted to the commission and its engineers for the information here given and for the privilege of reproducing this map.

CONNECTICUT'S LARGE ELECTRICAL UTILITIE

The larger electrical energy supply systems of Connecticut are those of the United Illuminating Company, with principal operating centers at Bridgeport and New Haven; Hartford Electric Light Company; Connecticut Light & Power Company, Waterbury and New Britain; Connecticut Power Company, Middletown and New London, and the Shore Line Electric Railway Company, Norwich. The Connecticut Company, operating the greater part of the street-railway service of the state, and the New York, New Haven & Hartford Railroad, operating an electric train service between New Haven and the New York suburban zone, complete the larger electrical systems. The New Haven road sells energy for central-station service at Greenwich and Norwalk, but the greater portion of its output is used in its transportation service. The Connecticut Company sells little if any energy for domestic or industrial use.

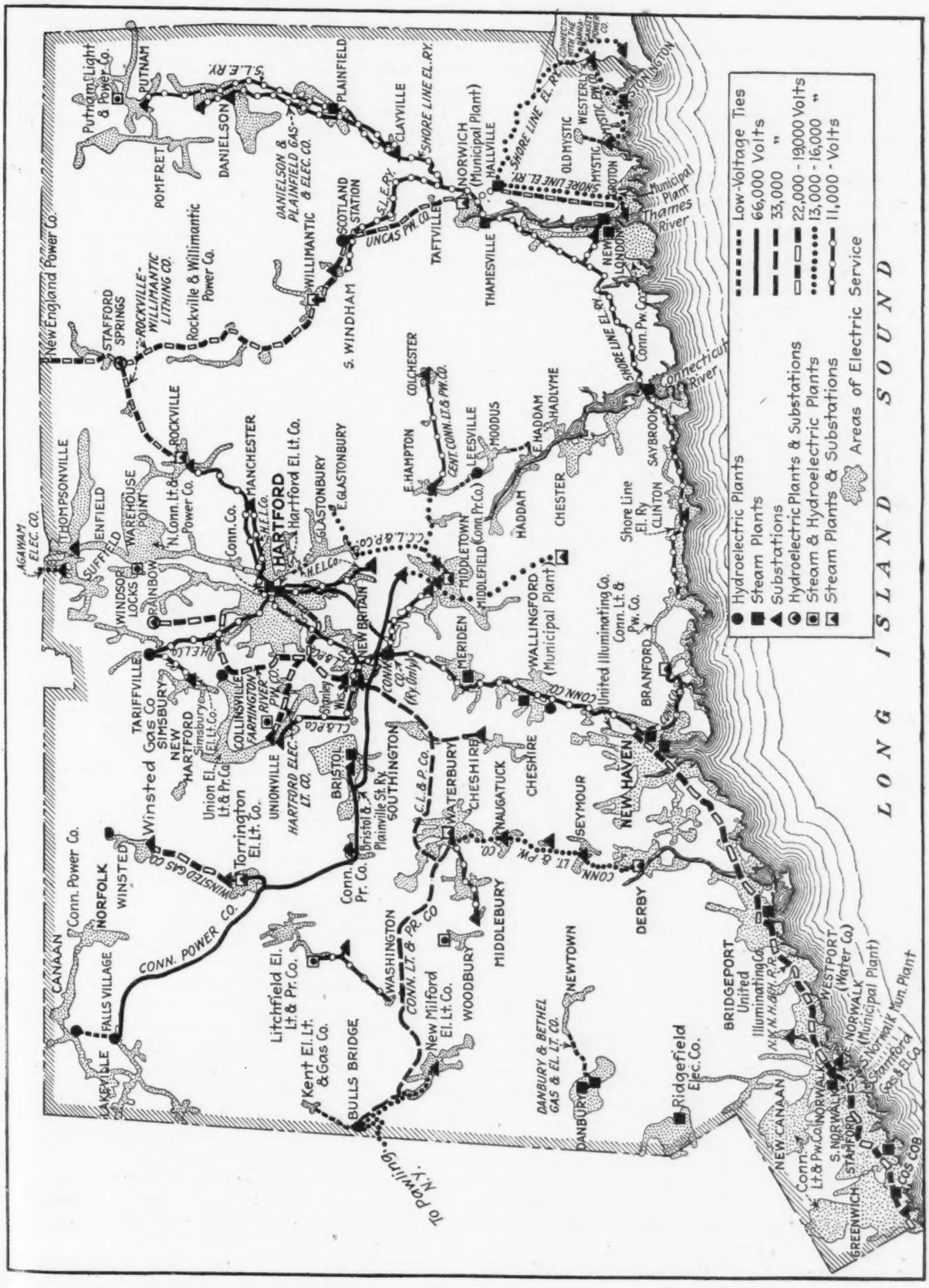
Lines over which energy is transmitted at 11,000 volts or more are included in the map of transmission systems. The highest voltage line in the state is the 66,000-volt transmission of the Connecticut Power Company, which runs from the Falls Village hydroelectric station in the northwestern area southeasterly through the middle industrial section of the state to the outskirts of Middletown, also connecting by branch lines or taps to substations in Torrington, Thomaston, Bristol, New Britain, Cromwell and Hartford. From the step-down transformer station outside Middletown energy is delivered at 13,200 volts to a distributing substation in the city. This is tied in with a local steam plant of the company situated on the bank of the Connecticut River. East of Middletown a connection is made through a step-up transformer station to the 13,000-volt lines of the Central Connecticut Power & Light Company, serving a territory in which the principal towns are Glastonbury, East Hampton, Haddam, Colchester, Moodus, Hadlyme and East Haddam.

CONNECTING HYDROELECTRIC AND STEAM PLANTS

The Connecticut Light & Power Company operates a 33,000-volt transmission line extending from a hydroelectric plant at Bull's Bridge to Waterbury and thence through Southington to New Britain. Middlebury, Naugatuck and Seymour are supplied from this system, but at 11,000 and 13,000 volts. At Seymour a tie is effected with the system of the Derby Gas & Electric Company. An 11,000-volt tie line has been built between the Dutch Point station of the Hartford Electric Light Company and New Britain.

The interconnections in the central part of the state therefore make it possible for the hydroelectric plants at Falls Village, New Canaan and Bull's Bridge and the steam-driven central stations at Waterbury, Hartford, Derby and Middletown to feed a transmission network mutually or independently as the load conditions dictate, supplemented by smaller hydroelectric plants and by various steam stations in the local territory. The four principal stations, at Hartford, Waterbury, Bull's Bridge and Falls Village, have a combined rating of 76,500 kw. and an annual energy production of about 170,000,000 kw.-hr. The Hartford and Waterbury plants are respectively rated at 36,000 kw. and 25,500 kw. In round numbers, the total capacity of the plants interconnected in this central transmission network is 100,000 kw. and the annual output 200,000,000 kw.-hr. The tie connections now in force enable the Hartford company to interchange energy with the Connecticut Power Company and the Connecticut Light & Power Company through New Britain by two routes.

The Winsted Gas Company's system and that of the Torrington Electric Light Company are also tied into the Falls Village line, and the Bull's Bridge plant is



INTERCONNECTIONS WHICH HAVE BEEN MADE IN CONNECTICUT

It has been impossible in the space available on the map to indicate all the electric companies operating in each town; therefore only the most important have been included. The shaded areas indicate the portions of the state supplied with electric service.

connected with Pawling, N. Y., by an 11,000-volt circuit.

Near the Massachusetts boundary the system of the Northern Connecticut Light & Power Company is connected with the Agawam Electric Company by a 13,000-volt line. The latter company is one of the properties affiliated with the Turners Falls Power & Electric Company of Massachusetts, which operates an extensive hydroelectric and steam system in the middle Connecticut valley. Farther east the Rockville & Willimantic Power Company is connected with the New England Power Company by a 22,000-volt line crossing the Massachusetts border. The New England and Turners Falls systems are interconnected at an outdoor switching station at Leverett, Mass. At this writing these interstate interconnections represent only the beginning, probably, of a more comprehensive tying together of Connecticut and Massachusetts systems. Thus the Shore Line Electric Railway is building a new steam plant near Norwich, Conn., which is to be connected with the New England Power Company's system through a new transmission line not on the map.

Another interstate connection of interest is that of the Mystic Power Company with the tidewater steam plant of the Narragansett Electric Lighting Company at Providence, R. I. A transmission line running from the Providence district to Westerly provides for this. The Providence plant is interconnected with the New England Power system lines in southern Massachusetts.

The above are the more important interconnections now in force in the state. Along the Sound, the New Haven railroad transmission lines supply central-station service in Greenwich and Norwalk, but there are no important interconnections by which the supply of energy may be reversed on a large scale, as in the central part of the state. A tie line exists between the local systems of the Connecticut Light & Power Company in Norwalk and the municipal plants in South and East Norwalk. A low-voltage tie also exists between the Hartford Electric Light Company's system and the Glastonbury lines of the Central Connecticut Power & Light Company. An interconnection in Danbury between the plants of the local street railway and central stations is just about to be completed. A new hydroelectric station is under construction at Stevenson, on the Housatonic River, which will be tied into the transmission network of the Connecticut Light & Power Company.

Permanence in Outdoor Substations

Discussion of Standard Design Used in All Sizes from 300 Kva. to 2250 Kva. in Order to Eliminate the Fire Losses Prevalent in Modern Structures—Increase in Cost to Secure Permanence Held to Be Negligible

BY S. B. HOOD
Superintendent of Distribution, Northern States Power Company

ONE of the great problems in high-tension transformer design is to get the leads out of the case," said a prominent engineer once in making an address before a branch of the American Institute of Electrical Engineers. The same problem has to be solved over again to get the leads out of a building in case the transformer is installed in one. This unnecessary complication has been one of the biggest spurs leading to the design and construction of a class of substation in which the entire equipment is out of doors. From a more or less crude assembly of equipment the outdoor substation has of late years developed to a state approaching absolute permanence. Not being hampered for room, the spacing between points of opposite polarity can be made adequate. Any damage resulting from failure of insulation is confined closely to the point of failure.

Some years ago a large Central Western utility company constructed a network of 34,000/60,000-volt lines serving a scattered community located within a radius of about 100 miles (160 km.) from the main source of power. At that time outdoor equipment was generally special, as a result of which a number of substation installations were housed in buildings constructed of wood frames sheathed with corrugated iron. Since then practically all of these buildings have been destroyed by fires starting from various causes.

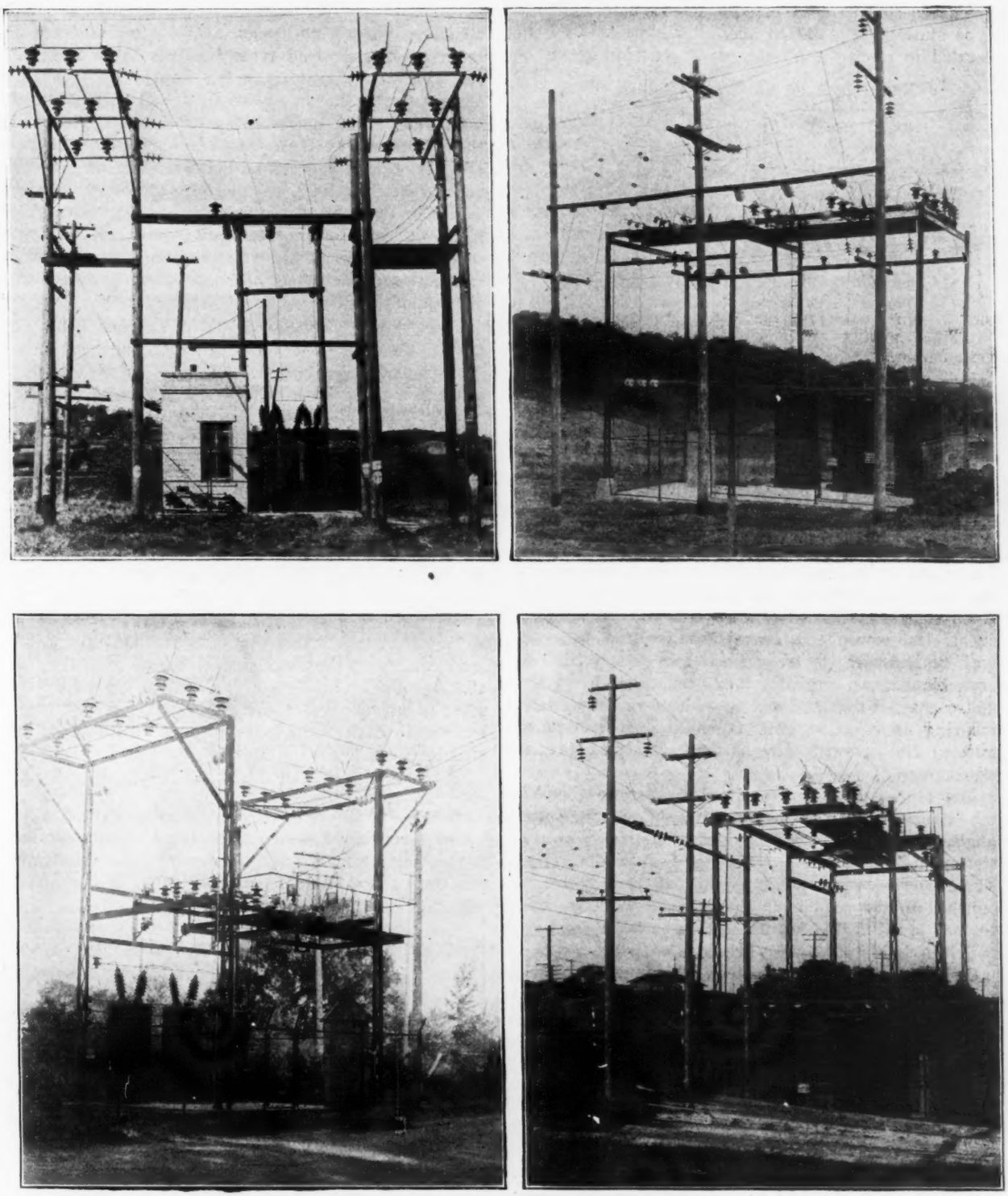
When outdoor stations were first employed the supporting structure usually consisted of four standard wood poles set in the transmission line. The necessary pole-top switches were mounted on these with the local control switches, fuses, etc., placed on cross timbers between the poles. The transformers were placed on a platform of wood timbers bolted to the poles a few feet above the ground line. As most of these structures were erected along country highways, they were particularly subject to the hazard arising from grass fires.

The experience gained from the operation of both this type of outdoor substation and the indoor type in non-fireproof buildings has resulted in all new stations, except those of a most temporary character, being constructed of fireproof materials. Fig. 1 illustrates the older type of wood-pole structure on which the high-tension equipment is mounted. Originally the transformers and low-tension apparatus at this station was housed in a building which was destroyed by fire. The transformers were then placed outside and a small fireproof building constructed to house the local 2300-volt switching and metering equipment. Fig. 3 shows a modern outdoor fireproof substation for the same service as that shown in Fig. 1.

A one-line diagram of this station is shown in Fig. 5, which is also typical of most of the stations serving the towns on this netwook. The transmission lines are arranged in rings, making it possible to sectionalize in either direction without interrupting the service to any substation. The station tap is taken off between

these two sectionalizing switches, leading through an outdoor air-break switch, choke coils and fuses to the transformers.

For lightning protection electrolytic arresters have been used at some points, where attendance was at hand for the daily charging. All the new stations have sufficient space on the platform to accommodate electrolytic or similar arresters if desired. In a number of cases several types of horn gap with series-resistance arresters have been tried out with varying degrees of success. At this date definite results as regards the protective value of these arresters is not available. About all that can be said is that "the patient has survived either with the aid of or in spite of the treat-

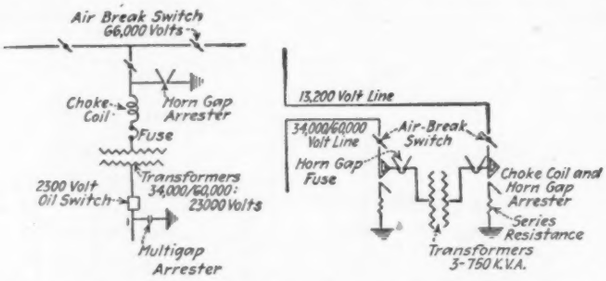


FIGS. 1 TO 4—OLD AND MODERN TYPE OUTDOOR SUBSTATION

Fig. 1 is a typical example of the old inflammable design once used, while the others are built after new fireproof designs.

ment administered." Under such conditions it may possibly be safely assumed that the arresters are doing some good; in any event they have done no harm and their installation does not involve a very heavy expenditure.

The equipment used in both the old-type and new-type stations is standard and interchangeable. Being carried in stock for all classes of construction, it be-



FIGS. 5 AND 6—ONE-LINE DIAGRAM OF TYPICAL STATION IN LOOPED NETWORK AND CONNECTIONS FOR ONE AT END OF HIGH-VOLTAGE LINE

comes possible to assemble a new station without delay or the purchase of special apparatus. This feature is also of value when repairs are found necessary. To this extent there is no difference in cost between the new fireproof construction and the old with an infinitely greater fire hazard.

In the new design the principal supporting members consist of standard 35-ft. (10.6-m.) expanded steel poles. These are set in concrete. The entire ground area of the station is covered with a heavy concrete blanket. Upon completion the station area is inclosed within a substantial woven-wire fence fitted with a gate and with barbed-wire top guards. Before laying the concrete blanket two or more 2-in. (5-cm.) pipes are driven and connected together and to each of the steel poles, insuring an effective ground connection. The transmission line ground wire is also connected to this structure.

The cross-beams, braces, etc., required to complete the structure are composed of light channels and angles, an assortment of which, together with the steel poles, forms part of the standard stock carried. These members are largely laid out and drilled or punched in the company's shop. Such work as must be done in the field is facilitated by a portable electrically driven drill press, emery grinders, etc.

Owing to the rapid fluctuation in unit prices of materials, it is not possible to give comparative costs between the all fireproof design and the older wood-frame type. It is safe to say, however, that the cost of the station shown in Fig. 3 did not exceed $500 over what would have been required for a wood-pole and timber structure. As the present capacity of the station is 600 kva. with room to increase to 1500 kva. without change in structure or equipment (other than the transformers) the increased cost per kilovolt-amperes is almost negligible. As to appearance, one has only to compare Fig. 3 with Fig. 1 in order to form his own conclusions. On the score of reliability and decreased maintenance the permanent design naturally leads.

A larger type of station, built along the same lines and using the same class of material, is illustrated in Fig. 2 and Fig. 4. This station serves to connect the high-tension line with the 13,200-volt feeder from the source of supply at one end of the loop. A single-line diagram of it is shown in Fig. 6.

In the station mentioned, having a capacity at present of 2250 kva., six poles have been used for the main structure. The high-tension and low-tension leads enter from a spur lead from the main pole line. All the auxiliary equipment being located on the upper deck, there is no chance of an arc from the various horn gaps rising and flashing over to material above them. Access to these air-break switches and horn arresters can be had from a platform laid on their supporting beams. The platform is reached by an iron ladder in the rear of the structure. This platform is made of carbolineum-treated wood and is the only combustible part of the station other than the small standard portable telephone booth shown in one corner of both this and the station illustrated in Fig. 3.

The portable booth is made of sections bolted together, the floors and walls being of matched lumber (for insulating purposes). The roof is of galvanized sheet iron made up as a unit and set on like a candle snuffer. These are stock booths made up in lots as required, and in spare time, by the company's carpenter shop.

This station may appear to be unnecessarily high, which is accounted for by the poles being 35-ft. (10.6-m.) size. The extra height is no objection and may in the future be an advantage. Nothing could have been gained by cutting off the poles, and the angle of the leads between the station structure and the pole line would have been increased. The vacant space to the left of the main transformers is intended for future local equipment that will step down the pressure from 13,200 volts to 2300 volts to serve an adjacent town when requirements demand. When this is done an intermediate deck will be installed in this half of the structure, somewhat similar to that shown in Fig. 3.

Saving Coal by the Shovelful

The form here reproduced is that of a pledge which is used by C. A. Graves, administrative engineer for the United States Fuel Administration in New York,

United States Fuel Administration
Bureau of Conservation

This is to Certify

That I am helping the New York State Fuel Administrator by saving ..1.. shovelfuls of coal daily.
(100 shovelfuls per ton)

C. A. Graves

FUEL-SAVING PLEDGE

to encourage fuel saving. Even without the large war demand there is urgent necessity for coal conservation during the winter and it is desirable that public interest in fuel economy be stimulated by all possible means.

Factors to Consider in Applying Relays

Determination of Short-Circuit Current Connections and Settings Suitable for Radial and Parallel-Feeder Systems—Protection Against High-Resistance Grounds on Balanced Systems

BY E. A. HESTER
Engineering Division Westinghouse Electric & Manufacturing Company

THE art of protecting transmission lines by means of relays has advanced very rapidly during the last few years. Although a great many types of relays have been produced, few have survived the acid test of service on modern power systems. The relay, though one of the most inconspicuous things in a power station, is nevertheless one of the most important items in its equipment. Figuratively speaking, relays constitute the nervous system of that wonderfully complete body, made up of generating stations, substations and transmission lines. It is the part of the relay to detect and locate anything which tends to prevent any of these members from performing its proper function. When the trouble has been detected, apparatus which will isolate the faulty member from the remainder until the trouble has been remedied must be set in motion. Thus the relay is called upon to display an almost human intelligence and must function with a speed which is scarcely within the power of man. These requirements have been complied with, and it is safe to say that as the art advances much improvement will be made.

Many schemes have been used, but, strange to say, the first one evolved has up to the present time given the most satisfactory service. In this scheme of protection an overload relay is used at the generating end of the feeder when applied to radial systems, while on systems which include sections of parallel feeders a reverse-power relay is used at the substation end in addition to the overload relay employed at the generating end.

At first overload relays only were necessary as feeders were not operated in parallel, a spare line being available in case the first one failed. Then the economy of having all the lines in service all the time was realized, and as the demand for continuity of service could not be disregarded, it became necessary to develop a reverse-power relay for use at the substation end and operate the feeders in parallel.

APPLICATION OF RELAYS UNDER DIFFERENT CONDITIONS

No set rules can be laid down to govern the application of relays. Each and every power system has its own peculiarities, and the choosing and setting relays must be governed by these. However, if a careful study is made of the system and the conditions existing on each section are thoroughly analyzed, no great difficulty should be encountered in securing entirely satisfactory protection on any power distribution system.

In laying out a protective scheme on any system a great many factors have to be taken into consideration. The characteristics of the line and each piece of apparatus—generating, switching, transforming and converting—should first be carefully studied, as this is what determines the amount of short-circuit current which may occur. In determining this short-circuit current it should always be considered as due to a solid metallic short circuit with minimum generating capacity.

One method of determining the possible short-circuit current is to observe the voltage drop between two stations at normal load. Then the short-circuit current = (normal voltage ÷ voltage drop) × load current. This is only approximate, however, and is very likely to give high results.

Another method is to determine the total impedance, including that of the generator, between any point where the short-circuit value is desired and the generator. Then the short-circuit current = star voltage ÷ impedance. This gives the instantaneous short circuit, however, and the sustained value is much less, usually about two or two and one-half times full load current.

Unless a special scheme is used for disconnecting a line on a high-resistance ground, as would be necessary in the case of a generator having its neutral ground through a comparatively high resistance, modern relays will not clear a high-resistance short circuit. This is no disadvantage, however, as a high-resistance short circuit will invariably develop into an arc before any damage is done, and since an arc has a very low resistance the effect of a metallic short circuit will be obtained and the relays will operate.

The various connections and combinations used on a system also deserve careful attention when laying out a protective scheme. First the number and location of the power sources should be taken into consideration. The main thing to be considered is whether or not there is more than one source. A layout which would be suitable for a system having one source of power might not be suitable for another having more than one source. Therefore the writer will consider systems having one source separately from those having more than one source of supply. It should be borne in mind that this discussion is limited to three-phase distribution as most modern systems are of this type.

SINGLE SOURCE OF POWER

*Radial Feeders**—Protective relays should be applied to radial-feeder systems with a single source of power in such a way that when trouble occurs on any feeder it is automatically cut off from the remainder of the system, leaving the others in service. This is accomplished by giving the relays a selective action—that is, giving them such current and time settings that owing to their operating characteristics they will al-

*A radial system, an example of which is shown in Fig. 1, consists of one or more feeders leaving the generator busbars, each of which may or may not be in turn subdivided into a number of smaller feeders.

ways disconnect the feeder at the proper point before other relays on the unaffected sections can operate. On a radial system, such as is being considered, only overload relays are used. They are placed at the outgoing end of each section, except possibly on the ones most remote from the generating station, which may be protected by an instantaneous overload circuit breaker or by fuses.

From the full-load current values current settings are made so that the relay will not operate under normal conditions. From the short-circuit current values time settings are so chosen from the characteristic curve that each relay will operate in its order; that is, the ones at the greatest distance from the generating station will operate in the shortest time, the time element becoming larger as the generating station is approached. In Fig. 1 time settings for a typical radial system are shown, a half-second interval between the time of operation of each relay being chosen to allow for the operation of the circuit breaker.

The overload relays should be connected to the line as shown in Fig. 2. Two current transformers may be used on a system having an ungrounded neutral, but there are cases in which the relays will fail to operate, such as the occurrence of a ground on the unprotected phase and an accidental ground in the generator at the same time. Three current transformers will always give complete protection, and the insurance is worth the cost of an additional current transformer.

Parallel Feeders.—In a system composed of parallel feeders between the generating station and substation or between substations, an example of which is shown in Fig. 3, the best method of protection is to place an overhead relay at the outgoing end and a reserve-power relay at the incoming end of each feeder. Current settings are obtained in the same way as described for radial systems. The overload relays are given time settings with short intervals between, so as to secure selective action, while the reverse-power relays are all given the same short time setting, usually about one-tenth of a second. In Fig. 3 time settings for both overload and reverse-power relays on a typical parallel-feeder system are shown.

Typical Example of Operation

The operation in case of trouble can be seen from the following example:

Suppose trouble occurs on line No. 4 at *X*. Energy immediately begins to flow into the trouble from both ends of the line. It is evident that the overload relay on this line will operate before the overload relays on lines Nos. 5 and 6, because it gets approximately twice the current that flows in either No. 5 or No. 6. Also the reverse-power relay, in line No. 4 only, will operate because the power flow in this line only is reversed. Whether the overload or reverse power relay on No. 4 operates first will depend upon the point at which the trouble occurs. Thus the defective line is effectually isolated and the other lines are left in service without interruption.

Reverse-power relays are connected in the circuit as shown in Fig. 4. The current transformers are connected in star and the voltage transformers, of which two are used, are connected in open delta. It has been found that in order to secure the best action with reverse-power relays on low power factor, due to unbalanced short circuits, the voltage transformers should be so connected that at unity power factor the current in the current coils of the relay will lead the voltage by 30 deg. It has also been found that the most severe condition under which a relay must operate is when two conductors of a three-phase line are short-circuited. Numerous tests have shown that when connected with current 30 deg. in advance of the voltage reverse-power relays operate satisfactorily under this extreme condition. In order to obtain satisfactory results with this connection, however, it is necessary to take into account the direction of phase rotation as shown in Fig. 4.

The Ring System.—The main difference in the case of the ring system and in the case of two feeders supplying a substation is that each feeder is made to loop through a substation. Fig. 5 shows an example of the ring system and gives time settings for the relays. The operation of the relays is similar to that of straight parallel feeders, and when trouble occurs and the defective section is cut out the system becomes radial until this feeder is put into service again.

Systems with More than One Source

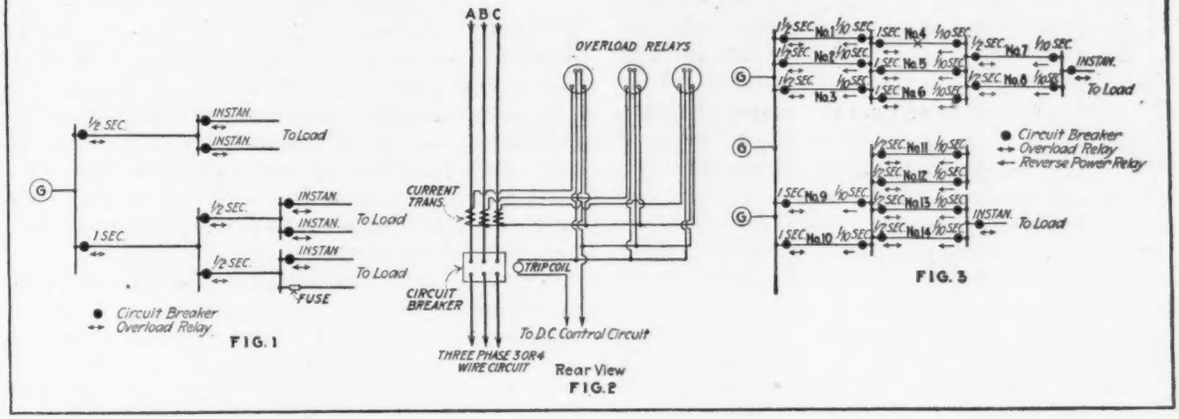
Parallel Feeders.—Lines operating in parallel where power is likely to flow in either direction can best be protected by using reverse-power relays differentially connected, as shown in Fig. 6. When the load is balanced it is evident that no current flows through any of the relays. However, when a short circuit occurs, say at *X*, the relays at both ends of the defective line operate to clear the line both because of the flow of the excess current and because the flow of power is away from the busbars.

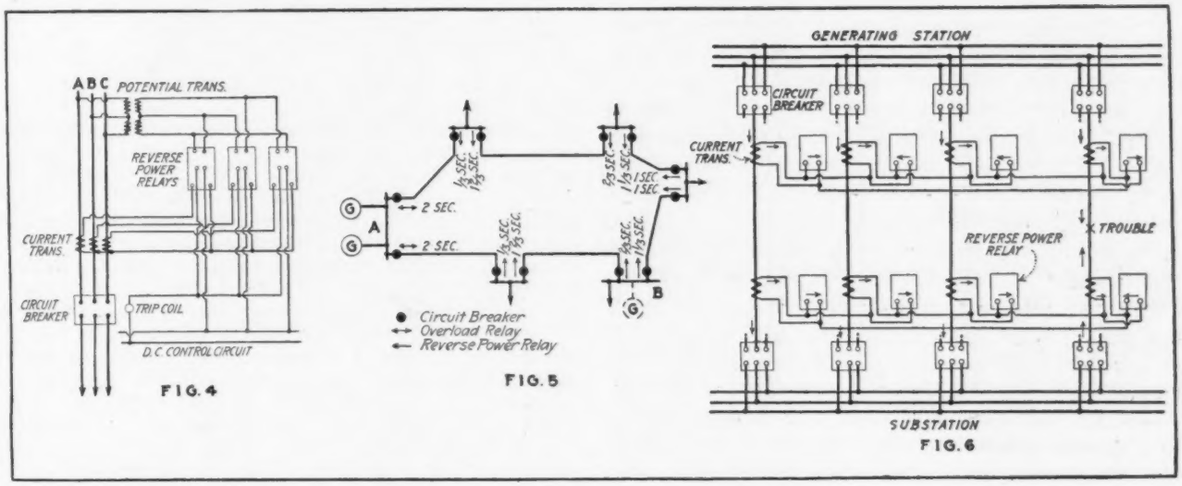
Clear perception of this can be obtained readily by referring to the diagram, in which the arrows show the direction of flow of the current and power. It will be observed that in every case the flow is in the direction to operate the proper relay. When using this scheme it is necessary to have auxiliary switches on the circuit breaker to short-circuit the current transformer on the defective line when it goes out of service. When two lines only are operated in parallel, a reverse-power relay having double contacts on the voltage element may be used. These contacts operate in such a way that they always open the breaker on the defective line only and leave the other with straight overload protection.

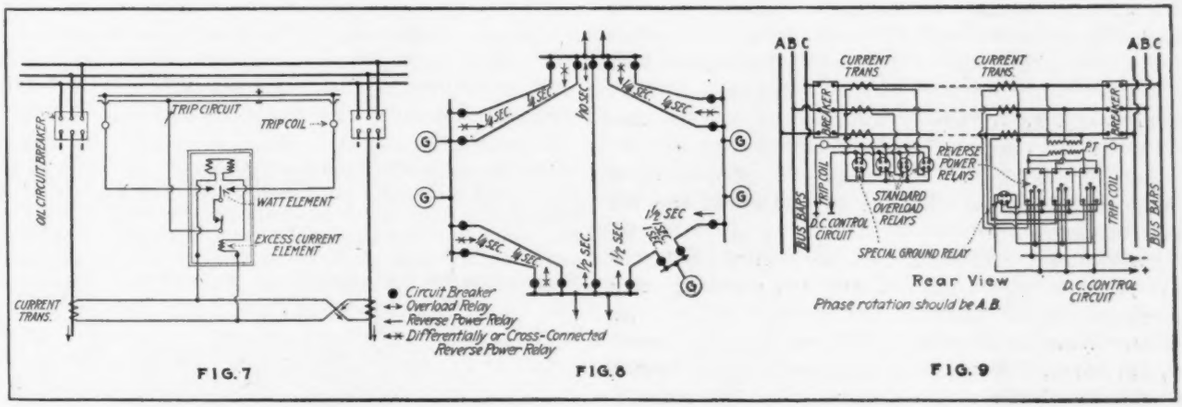
This scheme is shown in Fig. 7. For simplicity both Figs. 6 and 7 are shown for one phase only, and in Fig. 6 voltage and tripping connections are omitted.

In both the schemes mentioned the line and current settings may be made very small, but it is usually best to make the current setting somewhat higher than is theoretically necessary in order to take care of any operating difficulties that are liable to occur. No advantage can be gained by setting the relays to operate on smaller currents than those normally obtained during times of short circuit.

The Ring Systems.—If in Fig. 5 another generating station be placed at point *B* difficulties would be encountered when it became necessary for this station to carry the entire load. Entire readjustment of the relay







DIAGRAMS THAT FACILITATE PROPER APPLICATION OF RELAYS

Fig. 1—Radial distribution system. Fig. 2—External connections for overload relays. Fig. 3—Parallel feeders supplied from one source of power. Fig. 4—External connections for reverse-power relays. Fig. 5—Ring distribution system. Fig. 6—Cross-connected reverse-power relays on parallel feeders. Fig. 7—Double-contact, reverse-power relay applied to duplicate feeders. Fig. 8—Network distribution system. Fig. 9—Special relay connections to protect against high-resistance grounds.

would be necessary, but with some types of relays this can be done in a short time with no very great inconvenience.

The Protection of Networks

A great many modern power systems are so connected that they form a more or less complicated network. Some sections of these networks can be most satisfactorily protected by the methods suggested for parallel feeders having more than one source of power. Other sections to which these cannot be applied must be protected by some other method using either reverse-power or overload relays or a combination of both. No example can be given which will cover all the problems encountered in actual practice. Each case must be studied and the method applied which is best suited to it.

An example of a network is shown in Fig. 8 in which reverse-power relays are shown connected differentially for protecting some of the sections. For other sections, where this method cannot be used, reverse-power and overload relays are applied as best suits each particular case. Time settings are shown which will give the best selective action. There will be cases in which the circuit breaker on a feeder which is not affected will be opened, and in most cases this does not matter. It sometimes happens that by having other circuit breakers than those on the line actually affected open the problem of sectionalizing may be somewhat simplified. This is, however, a question which must be decided for each individual application.

It is possible by carefully studying and analyzing the conditions to secure automatic sectionalizing on any network regardless of its complications.

Protection Against High-Resistance Grounds

Sometimes it happens that a system has its neutral grounded through a comparatively high resistance, and when a ground occurs conditions may be such that the trouble current is actually less than the full-load current. Such a ground cannot be cleared by reverse-power and overload relays connected to protect the system against short circuits. However, this difficulty may be overcome by using an overload relay, constructed to operate on low currents and connected in the neutral lead of the current transformers as shown in Fig. 9. Under normal conditions no current will flow through the neutral lead of the current transformer bank, but as soon as the ground occurs the unbalanced current flows through this lead, operating the ground relay, and the circuit breaker is opened.

When used with overload relays the ground relay contacts are connected in parallel with the overload relay contacts so that its operation opens the circuit breaker directly. When used with reverse-power relays, however, the ground relay contacts are used to short-circuit the contacts of the overload element of the reverse-power relays, thus leaving the watt elements to discriminate as to the direction of power flow. This is clearly shown in Fig. 9.

It should be borne in mind that this scheme can be used only on balanced systems. For unbalanced systems other schemes are used utilizing special relays, but since these do not come under the subject of this discussion they will not be mentioned.

THE RELATION BETWEEN LIGHT CURTAILMENT AND ACCIDENTS

It Is Estimated that the Services of 108,000 Men Are Lost Annually Because of Accidents Attributed to Poor Illumination

IN A PAPER dealing with the problem of light curtailment in its relation to the national man-power shortage, read before the recent convention of the Illuminating Engineering Society, R. E. Simpson estimated the actual loss to the industries due to accidents and showed that the daily casualty list on this side is about as great as that of our soldiers on the western front. Of these losses perhaps 18 per cent are due to inadequate illumination.

Presenting figures on this annual loss from accidents, Mr. Simpson said:

> The recently enacted law extending the ages for selective service will have the twofold effect of withdrawing more men from industrial pursuits and at the same time placing greater burdens on manufacturers of war materials. In order to alleviate the present labor shortage and the threatened future decrease in the supply of workers, a nation-wide labor adjustment must take place. In addition to this there must be a policy of conservation of labor and the elimination of wastes and leaks, in the following out of which accident prevention will be an important factor.
>
> The significance of the last statement will be readily appreciated if we consider the effect of accidents in terms of time lost. From the published statistics of a number of states, together with conservative estimates for the remainder, we find that approximately 25,000 persons are killed or permanently disabled, 500,000 seriously injured and 1,000,000 slightly injured each year. Translating these figures by means of the accident-severity rates, we have a total of 180,000,000 days of lost time. This is equivalent to the loss of the services of 600,000 men for a full year of 300 working days. This economic loss is distributed over the entire country during a period of one year, and for that reason its effects are not so keenly felt or its importance recognized. If, however, this loss were concentrated on any one of our basic war industries, as, for example, shipbuilding, steel making, munition manufacture or coal mining, it would be nothing short of a national calamity. Even distributing this loss among the four industries named would seriously cripple all of them, and its effects would shortly be reflected by conditions at the battle fronts. . . . A large percentage of accidents may be classed as avoidable in the sense that the application of mechanical safeguards and the observance of safety rules will prevent them.

In pointing out the economic value of providing adequate industrial illumination Mr. Simpson said:

> The saving in coal by curtailment of industrial lighting would be negligible when compared with the ultimate economic loss. If, for example, the full year's labor of the 108,000 men that is lost annually because of poor illumination could be saved and applied to coal mining, 130,000,000 more tons of coal could be produced. To provide ample illumination for the safety of all these workers ten hours a day for a full year would require less than 10,000 tons of coal.

The author points out that attempts at economy are almost invariably made in places where reduced illumination is particularly hazardous. He says:

> Stairways, elevated gangways, passageways and storage spaces are generally inadequately lighted and are the first to suffer from a policy of light curtailment. The hazards associated with these poorly lighted sections of our industrial plants have been portrayed many times. Confirmation of these hazards has been given by the report of the British government survey of industrial accidents showing that 40 per cent more men are injured from falling and stumbling in the winter months than in the summer months.

Renovation of Discolored Arc-Lamp Globes

Glassware Used in Electric Street Lighting Units Deteriorates Owing to Discoloration—It Is Both Difficult and Expensive to Replace Globes, but a Method of Removing Stain by Heat Treatment Has Been Developed

BY ALFRED HERZ
Public Service Company of Northern Illinois

IT IS common knowledge that in certain cases after new glassware has been installed on street-lighting units a very obnoxious discoloration has occurred in a comparatively short time. Owing to the war conditions it has become increasingly difficult and expensive to replace this glassware. Experiments were therefore undertaken to recover the discolored but otherwise sound globes, and it was found that this could be done by a simple heat treatment.

The glassware which suffered the most was that subjected to the rays from arc lights rich in short ray lengths such as the magnetite arc. Some globes used on these lamps were rendered almost unusable, owing to this objectionable color, after four months' service. The lamp thus takes on the appearance of neglect of maintenance, so that objections to its use arose from the better residential districts.

FACTORS WHICH BRING ABOUT DISCOLORATION

The most common discoloration is purple and is only present where the artificial light strikes the glassware, such places as are shielded from the lamp rays being clear even after long use aside from coloring brought about by the rays of the sun. The amount of this discoloration depends on three factors: (1) The composition of the glass of which the particular ware is made; (2) the amount of violet and ultra-violet light present, either natural or artificial; (3) the length of time the glassware has been exposed to the influence of the light.

The glassware subject to this discoloration usually contains some form of iron, commonly Fe_2O_3 in some cases amounting to 6 per cent. This glass in its natural state is colored slightly green, and even common window glass has a greenish color, particularly when viewed from an edgewise position. The main reasons for using glass mixtures of this kind are (a) cost of material, (b) ease of blowing into the necessary shapes, and (c) toughness both mechanical and in resisting temperature changes. A bad feature of this glass, as just mentioned, is its greenish hue, especially when viewed in daylight, and various means have been tried for neutralizing this coloration.

Manganese compounds are found to be commercially most satisfactory for this purpose. Purple, the characteristic color of manganese, when added to the green in the original glass produces a very thin black cloud. Based on the three-color method, this action may be explained as follows: Green being white minus red and blue, purple being white minus green, the subtraction of green, blue and red leaves zero or black. The intensity of the black depends upon the amount of color present and upon the amount of neutralizing color necessary to balance this. Although the glass has the aspect of being clear and transparent, the thin black cloud formed as indicated nevertheless absorbs some of the light—usually from 10 to 15 per cent.

Under the action of certain light the purple manganese color itself becomes prominent, entirely overbalancing the green of the iron. The glass assumes at first a slightly heliotrope color and finally a very decisive purple. Since this purple color entirely penetrates the body of the gass, it at once became evident that a pickling or washing process would be useless. Having found that the color could be removed from pieces of broken globes by heating, further experiments were made, and it was found that these globes could be entirely cleared up by a careful heat treatment.

An annealing process carried out at a temperature of 900 deg. to 1000 deg. Fahr. (480 deg. to 540 deg. C.) was found to remove the color and at the same time to cause no softening or distortion of the glass globes. The annealing seemed to re-form the manganese compound into its original condition so that the glassware again became clear.

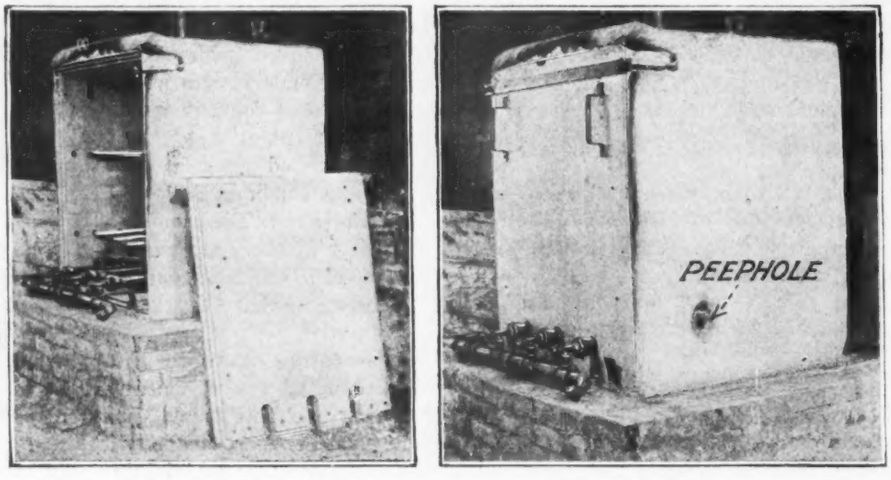
To measure the temperature existing within the oven a pyrometer was constructed out of discarded direct-current ammeter with suitable scale and operating from a double monel-copper couple with silver-soldered joints, the corresponding cold joints being remote from the annealing oven in a nearly constant temperature zone. The complete pyrometer was checked to within a few degrees of the working temperature by means of a high-reading mercury thermometer.

DESCRIPTION OF THE OVEN

In order to put the globe-reclaiming process into practice a gas-heated annealing oven was constructed. This oven was made of two layers of ¼-in. (6.3-mm.) asbestos board separated by ¼-in. (6.3-mm.) air space and an outer layer of $\frac{5}{16}$-in. (8-mm.) asbestos board, also separated from the inner boards by ¼-in. (6.3-cm.) air space. The front side was made removable and thus used as a door, suitable provisions being made to clamp this side onto the main part of the oven. The inside dimensions are 30 in. by 30 in. by 34 in. (76 cm. by 76 cm. by 86 cm.). The globes are slightly over 12 in. (30 cm.) in diameter and a little more than 12 in. (30 cm.) deep. A floor of iron rods spaced about 6 in. (15 cm.) apart is provided about 13½ in. (34 cm.) from the top and a second similar floor at about the same distance below the first. Hence two levels are furnished for four globes each, and the oven thus holds eight globes at a time. The space below the lowest level provides the necessary room for three gas burners and baffles for them. The pyrometer couples are placed about 6 in. (15 cm.) from the top and off to one side so as not to interfere with the operation of inserting or removing the globes. A flue connection is provided at the top of the oven, the connection being indirect or through the air spaces between the asbestos boards, the inner boards being drilled with a series of 1-in. (2.5-cm.) holes near their outer edges and a flue connection being made to

the air spaces. This tends to equalize the hot-air circulation within the oven and hence provide a more uniform heating. For the purpose of additional conservation of heat the outside of the oven was covered with a 1½-in. (3.8-cm.) layer of boiler covering.

Although the process here described seems applicable to various forms of glass subject to this discoloration, it was, as stated, especially developed for the treatment of globes from magnetite-arc lamps. In these lamps, as is generally known, one copper electrode and one iron ore "magnetite" electrode are used, the latter being consumed at a much greater rate than the copper. The combustion in the arc is accompanied with the production of large amounts of fluffy brown powder and with a certain amount of spattering of red-hot iron particles. These iron particles burn themselves into the inner surface of the globes, and the brown powder forms a deposit on the glass which is not readily wiped out. It has been found that swabbing the globes with commercial muriatic acid and allowing this to remain on the surface for about a half hour before rinsing off and wiping will remove all the brown deposit and a considerable percentage of the embedded iron particles. This removal of the surface deposits precedes the annealing process.



ANNEALING OVEN FOR TREATING DISCOLORED GLOBES

Air spaces may be seen in oven walls where door is removed. Note peephole in side for observation of gas flame.

The detailed method of procedure is as follows: The globes as removed from the line are treated with acid to remove the deposit, rinsed, dried and placed in the cold oven. The front of the oven is placed in position and clamped. The burners are lighted by means of pilot burners and the heating then proceeds, reaching the desired temperature in four or five hours. This high temperature is maintained for an hour. The burners are extinguished and the oven is allowed to cool for a matter of some twelve to fifteen hours. Care is taken not to open the oven before the interior temperature has reached about 120 deg. Fahr. (50 deg. C.) or less, otherwise cracked globes will result. The whole cycle can easily be gone through in twenty-four hours. The cool globes are then taken out of the oven and washed with soap and water inside and outside. An astonishing clearness and brilliance compared to the globes as removed from the line results, and the appearance of new globes is approached. Globes bent out of shape obviously indicate local overheating, due to poor heat distribution, or general overheating. On the other hand, globes with streaks of color probably result from insufficient heat or also from poor heat distribution.

Employing this process with room temperature approaching 0 deg. Fahr. (— 18 deg. C.) with the oven loaded with eight globes, one treatment took 900 cu.ft. (25 cu.m.) of 635 B.t.u. gas. Certainly the whole batch of eight globes were not perfectly renovated in every case, but assuming that six globes always come out commercially perfect, the gas consumption per globe would be 150 ft. (4.2 cu.m.) and would cost a matter of 15 cents when the price of gas is $1 per 1000 cu.ft. The total cost of the treatment per globe, allowing for labor, could be put at 35 cents at the outside, truly a nominal figure in view of the present cost of globes, approximately $2. This process also has the distinct advantage of avoiding the inconvenience due to uncertain delivery.

Certain variations of the glass composition have been noticed. Some globes become discolored more readily than others, and it has been observed that these globes are the easiest to renovate and also are more apt to be distorted because of overheating. Likewise those globes not so readily colored are also harder to renovate and are not so apt to lose their shape as are the other sort.

Although this scheme has been in use but six months and the oven has not been worked to capacity owing to lack of reserve globes in sufficient quantities to permit the removal of globes from the line for treatment, the experience obtained to date shows that the treated globes remain clear for at least 75 per cent or more of the time necessary to discolor new globes to the same density.

In case other ovens are constructed for this purpose it is strongly recommended that these be electrically heated since better distribution of the heat would then be obtained because of the absence of flue connection and air admittance for the burners, making it possible that all globes shall be fully heated and equally clear when removed from the oven. Minor changes from the present oven design could also be made to advantage.

TO THINK of cheapness in connection with foreign trade is just as wrong as trying to pin bargain tags on soldiers. Foreign markets are not going to be won or held by cheapened American workers or by bargain methods in American life.—*Edward N. Hurley, Chairman United States Shipping Board.*

STATION & OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

GENERATOR FAULT THAT LONG EVADED DETECTION

Apparent by Ticking Sound, Fault Did Not Show Up on Ordinary Tests—Finally Located with Spark Coil

BY A. M. SEVERSON

In operating a second-hand generator that the writer was called upon to start up, a peculiar clicking noise was noticed that should not characterize a good machine. Having received the generator under a guarantee and tests having failed to disclose anything wrong with it, the writer was somewhat disturbed regarding the cause of the noise. Repeated tests were of no avail. Finally one day, after the load had been increased to a value greater than this machine had been carrying before (only one-quarter of its rating, however), two loud reports accompanied by blinding flashes put a climax to the suspicious action of the machine.

Upon close scrutiny no trace of a burn-out could be found, and voltmeter tests again failed to locate any fault. Since no galvanometers or delicate testing instruments were available, the writer decided to try a high-tension breakdown test, it being assumed that no more harm could be done than had already evidently been caused by the flashes. The apparatus used consisted of an ordinary spark coil, such as that used for automobile ignition, and eight dry cells. Testing from terminal to terminal produced no visible effect. However, when one terminal of the spark coil was applied to the body of the machine and the other to the commutator a flash occurred on the end of the armature which had manifested trouble when it was operating.

Close investigation revealed the fact that the bar winding was loose in the slot and the insulation had been worn away at the end of the armature where the conductor bar bends. The writer tried with his thumbs to force the bare spot on the bar into contact with the armature core, but it was too rigid and would spring back into the center of the slot. Evidently the magnetic force exerted on the bar at no load was not strong enough either to force it into contact with the core since the machine would generate full voltage without trouble until the load was increased beyond a certain point. When the machine was being operated under load the bar would flop from one side of the slot to the other, causing the clicking noise which has been previously mentioned.

Finding no other faults in the armature, the loose bar was wedged in the center of the slot by thin pieces of hard dry wood, there being no fiber available. Then the bare spot was cleaned with a toothbrush, thoroughly coated with rubber cement and allowed to dry over night. In this condition the generator has operated satisfactorily. It should be rewound to be permanently serviceable, but production depends on it, so the temporary repair will be relied on to carry it along until a dull business period.

OILING TEXTILE MOTORS IN LARGE MANUFACTORIES

Improper Oiling Detrimental to Machine as Well as to Fabrics—Ring Oilers and Ball Bearings and Their Care

BY L. E. WOOD

In large industrial establishments where numbers of small three-phase, 60-cycle, ½-hp. textile motors are used for driving looms the bearings and oiling of the motors must be carefully watched if stoppages are to be avoided. Oiling, having to be done after the day's work is over, is usually carried out in a very slipshod manner. One man will flood the bearing, allowing oil to get into windings and on the floor, where cotton lint siphons it onto the warp or cloth, resulting in trouble. Another oiler finds it too much trouble to remove the screws that hold dust-proof covers and pours some oil round the shaft, the result of which shows in due time in the form of a seized brass.

Opinion seems divided as to the use of ball bearings for this class of work. The writer's experience is as follows: The jar on the driving bearing of a gear-driven loom is tremendous, especially when the loom "bangs off." In the case of a ball bearing this jar in time makes itself manifest by wearing a groove in the rotor shaft. This wear allows the rotor to rub the stator at this end, and if not corrected in time will cause burn-out of the stator. The rotor must be taken out and the groove filled in with metal and afterward placed in a lathe and trued up. As this would only last a very short time, some other remedy must be looked for in order that ball bearings may be used to their full advantage.

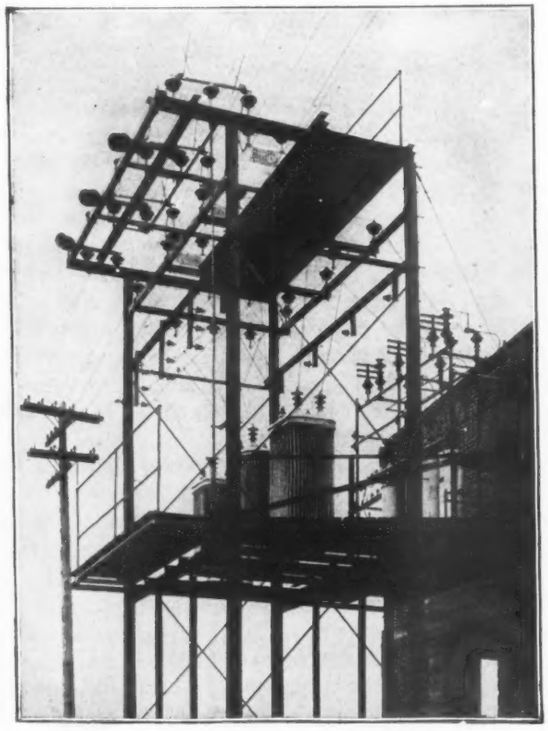
To the writer it seems that if designers would make the ball housing long enough to accommodate two bearings instead of one, and use a liberal size of shaft, the evil mentioned would be entirely eliminated. The double bearing need only be applied at the driving end. The ball bearings used on shafting for group driving are very satisfactory and permit a huge saving in oil and oilers' time, as they only need filling with grease every six months, but a ring oiler must be examined weekly.

A very satisfactory method of using a ring-oiler bearing without the ring is to employ a pad of tow or waste in place of the ring, the pad being kept saturated with oil. To prevent the bearing becoming flooded with oil a hole may be left open in the bottom of the well so that any surplus oil will run out, thus keeping the winding absolutely free.

OUTDOOR STATION SOLVES HIGH-WATER PROBLEMS

Even with Building Space Already Available, Indiana Company Chooses Outdoor-Type Substation for 600-Kva. Installation

When the Indiana Public Service Company of Aurora, Ind., contracted to take power from the Union Gas & Electric Company of Cincinnati, Ohio, over a 33,000-volt, three-phase, 60-cycle, 29-mile (46.6-km.) transmission line it was confronted with the question of providing a receiving substation. At the outset the load to be served amounted to only about 600 kva. Most of this was lighting. But an additional 300-hp. motor load was soon to be connected. Space was available in the old generating station for the receiving station equipment. An analysis of the situation showed, however, that it would be cheaper to erect an



OUTDOOR SUBSTATION OF INDIANA COMPANY

outdoor substation than to use the indoor space on account of the fact that the use of high-tension wall or roof bushings could be avoided and the outdoor bus structure and wiring would be less expensive. Moreover, by using a high structure out of doors it was seen to be possible to put the equipment well above the high-water mark of the Ohio River, which is near the plant. Another consideration was that future upkeep on the old station could be kept at a lower figure if the substation were placed out of doors than if it were housed in the already old structure.

The station as it was installed is shown in the photograph. It consists of a steel-tower delta-star substation large enough to carry three 500-kva. transformers. A steel structure was chosen because in future appraisals it will be regarded as a permanent structure, while a wood-pole structure might be regarded as more or less temporary. At present the station is equipped with three 200-kva. Wagner transformers. To facilitate changing these units an I-beam heavy enough to carry a 500-kva. transformer has been made a part of the top structure of the station. The transformers sit on removable I-beams. To remove one of the units it is lifted about 1 in. (2.5 cm.) by means of a block and tackle attached to the heavy overhead I-beam and is then lowered after the supporting I-beams have been pushed aside.

As protective features the station is equipped with a high-tension three-pole remote-controlled air-break switch equipped with carbon-tetrachloride fuses and long-turn cylindrical choke coils mounted as a common unit. In addition to this apparatus the station is equipped with General Electric electrolytic lightning arresters so arranged that they can be isolated by opening disconnecting switches. The installation was made under the direction of R. C. Rockefeller, local manager for the Indiana Public Service Company.

SOLUTION OF METER-TESTING PROBLEM OF SMALL COMPANIES

Several Companies in Wisconsin Have Adopted a Group Plan to Provide Accurate Testing at 40 Cents per Meter

Arc-lamp trimmers, assistant firemen and linemen usually do the meter work for small companies in their spare time. As a result the meters get little if any expert attention. It would seem to be a better plan, says George W. Hewitt, foreman of the meter department of the Minneapolis General Electric Company, to hire a trained meter man to look after the meters and have him utilize his spare time working on the arc lamps or helping with wiring or assisting the linemen. By this scheme the central station would be able to give the meters the benefit of a trained man. By this is not necessarily meant a college graduate but rather a man who has learned how to test meters for some large company, or preferably a medium-sized company. A man from a large company might not work out so well, because in the larger concerns it is necessary to train a man to do one thing and do that quickly and well.

The testing problem of the small company will admit of any one of three solutions with a fair degree of satisfaction. First, some outside party may be called in to test the meters at given periods. The second plan is to hire a meter man and use him to test, repair, read and install the meters, and then utilize his spare time at other work. The third plan, and the one that seems to be giving general satisfaction all the way around, is for several plants to club together and operate a joint meter-testing department. These plants hire a good meter man and have him make the rounds testing all the meters, each company paying its prorated cost.

A group of plants is following the latter practice in Wisconsin with remarkably good results. The general average cost of operating this plan is about 40 cents per meter. This covers railroad expenses and hotel expenses, as well as other costs. As an approximate rule it may be figured that 1500 meters will keep one man busy where he tests, repairs, reads and installs the meters. A fairly good man ought to average from eleven to twelve meters per day.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

EFFECT OF DAYLIGHT SAVING ON CENTRAL-STATION INCOME

Not Only Is There a Decrease in Revenue from Lighting, but Also Rebate for Street Lamps Brings About Considerable Loss

The effect of daylight saving on the earnings of the Cambridge (Mass.) Electric Light Company was discussed by W. R. Eaton at the recent convention of the New England Section of the N. E. L. A. A comparison of the records of the Cambridge company for the past three years shows that for the months of April to August inclusive there was a very material reduction in energy sold to lighting customers for the year 1918 as compared with the two previous years. Long before daylight saving was put into effect in Cambridge, however, public meetings were held in that city to bring about fuel saving by cutting down the consumption of energy for lighting.

The increase in total business of 1916 over 1915 was 20.8 per cent, of 1917 over 1916, 16.2 per cent, and of 1918 over 1917, 21.3 per cent. While the single-phase or lighting feeders show an increase of 10.4 per cent for the first period and 23.1 per cent for the second, they show a decrease of 5.8 per cent for 1918; that is, an average annual increase of about 14 per cent became approximately a 6 per cent decrease for the entire period, in spite of the fact that the sales for power purposes had materially increased, and as a good proportion of this increase was due to night work, it should have increased the sales for lighting purposes.

Records of the amount sold to the town of Belmont give a better indication of what daylight saving has done for the small stations, whose load is principally residential and small store lighting. An average annual increase of 16 per cent has been in the case of this township changed to a 14 per cent decrease.

A comparison of income loss with the kilowatt-hour loss shows, as would naturally be expected, that the whole loss was at the maximum rate of 9 cents.

Another reduction of income which is closely related to the reduction because of daylight saving is the reduction in street-lighting income and the question of rebates to municipalities when the discontinuance of lamps and reduction of lighting hours are ordered by the conservation committee.

Last winter, when the restricted hours of street lighting were first enforced, the Cambridge company found that in rebating to the city the operating or running charge for all lamps shut out entirely and a pro-rata reduction of this same charge for the number of hours not burned on the other lamps, the loss in revenue was $5,000, while the most generous estimates showed an actual saving to the company which amounted only to about $2,100.

For this reason when the second orders for curtailment were received the company began to inquire of its neighbors just what their policy was in making these rebates. It was surprised to learn that some companies were rebating the whole price of the lamps for those shut out. This seems altogether too generous, the author maintained, when it is considered that in most cases these lamps are held in a readiness-to-serve condition and are only awaiting orders to have the service turned on.

While rebating the running charge only would seem a fair settlement under normal conditions, yet when it is remembered that any loss of revenue for this service must react to raise prices on other services to cover the abnormal increase in cost of fuel, it would seem that a fairer method would be to rebate pro rata the amount saved per lamp-hour.

CUSTOMERS' DEPOSITS DO NOT NECESSARILY PROTECT

Utility May Pay More in Interest Rates on Deposits than the Bills That Might Not Be Paid Would Amount To

Deposits made by customers as protection to the lighting company might, unless carefully handled, result in a loss to the utility greater than the amount that might be saved by preventing dishonest customers from defrauding the company. No strictly uniform practice exists regarding the size of deposits, from whom they shall be required, method of refunding or rate of interest allowed.

Interest as a rule is from 5 to 6 per cent. Not only is this rate of interest substantially higher than can be obtained as a rule from savings banks, but, what is more to the point, it is higher than the banks allow the utility on its bank deposits. If, therefore, a company has a strict rule of requiring say a five-dollar deposit from every customer not a householder and keeping that deposit as long as the customer continues to take service, then the company is paying from 25 to 30 cents per customer annually to protect itself against the few persons who might move without the formality of paying their bills.

A good many utilities have seen the error of paying more for protection than the value of that which they wish to protect. These companies have taken the position of not allowing a deposit where the customer is able to establish his credit. Besides this, if after some months of service the customer can establish his credit, the deposit is refunded. With many companies regularity in paying monthly bills will establish the customers' credit sufficiently to permit the refund of the deposit.

STAGGERED HOURS OFFER 15,000 KW. SAVING AT BOSTON

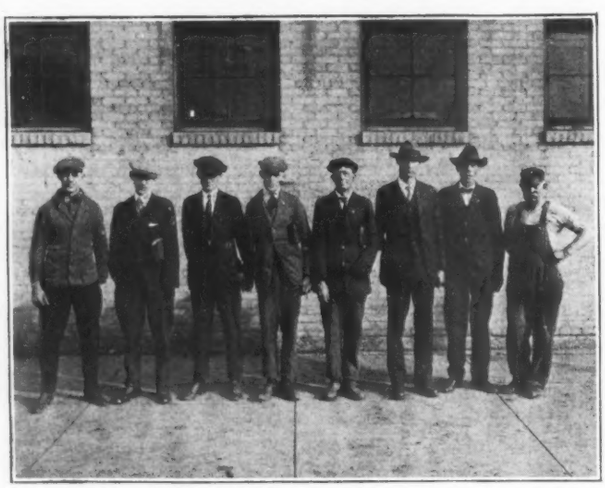
Investigation Shows that It Would be Necessary to Change Working Hours of About Thirty Industrial Establishments Only About Thirty Minutes

If staggered working hours are adopted at Boston this winter, at least 15,000 kw. in generating capacity will be released on the system of the Edison Electric Illuminating Company for service in the peak period. At a recent meeting of the Boston Section of the A. I. E. E., L. L. Elden, electrical superintendent of the Boston company, said that to add the above rating to the existing plant capacity during forty-five winter days it would be necessary to change the working hours of about thirty industrial plants only about thirty minutes. The above saving represents about one-sixth of the total estimated peak load of the Boston system for the coming winter. To realize it the coöperation of large plants like the Hood Rubber Company, Watertown, the Watertown Arsenal, the Fore River and Squantum shipyards and others now on Edison service would be necessary. The comparatively small change in closing hours required to realize so substantial an increase in available station rating was something of a surprise to those investigating the possibilities.

ONE-ARMED MEN EMPLOYED BY DAYTON (OHIO) COMPANY

Several Men Injured by Industrial Accidents Successfully Used as Meter Readers, Meter Testers and Water Tenders

Among the effective employees of the Dayton (Ohio) Power & Light Company are a number of men who have lost one of their arms through industrial accidents. In the national emergency the government was unwilling to



ONE-ARMED METER READERS AND INSTALLERS AND WATER TENDERS EMPLOYED AT DAYTON

accept their services in its combatant forces, but the local central station afforded them an opportunity to do their bit by working at jobs that kept munition plants speeded up. One of the men in the photograph has been associated with the Dayton Power & Light Company since Jan. 19, 1916. He is employed as meter installer. Four of them are meter readers. These men have all been employed during the year 1918 to replace meter readers who are in military service. The remaining three are water tenders at the Third Street power plant of the company. They also are replacing men who have entered the service of the government.

MAKING ELECTRIC RANGES STAY SOLD WHEN ONCE SOLD

Education of Employees, Speedy Installation and Accurate Voltage Check Make Possible 99 per Cent of Satisfied Customers

Before starting an electric range campaign in the summer of 1918, the Duluth (Minn.) Edison Electric Company held meetings to instruct its troublemen in the care of ranges. Moreover, meetings of a general educational character for all employees were conducted to familiarize them fully with the use of electric ranges and the advantages of cooking by electricity. The purpose of this was to enable any one in the company's organization to give an intelligent answer to questions about a range so that the public would understand that the electrical people had confidence in their product.

Public demonstrations were held daily for one month, during which extensive newspaper advertising was carried on and circulars were mailed to a selected list of prospective customers. As new "prospects" were gained from names recorded at the demonstrations, further literature and follow-up letters were sent. Previous to the advertising campaign four sets of circulars were sent to a list of very good "prospects," so that by the time the newspaper advertising came out these people were in a frame of mind to receive the company's advertising in good faith. During the demonstration salesmen followed up these hoped-for customers, devoting especial attention to those who had been to the demonstrations and those who had returned postal cards.

Upon receipt of an order for a range every effort was made to install it promptly. As soon as the range was installed a recording voltmeter was put on the circuit to find out if the proper potential was being obtained. As soon as the chart was completed it was scanned carefully to see if it showed low voltage. If it did, the line department was immediately notified and the trouble remedied. This eliminated complaints of ranges operating too slowly because of low voltage. Further complaints were forestalled by the demonstrators.

After the campaign was over a cooking bureau was established where the company conducted a cooking class once a week. Notices of this meeting were sent to range users and to those interested in electric ranges. A feature of this class was an offer of the company's demonstrator to try any recipes that might assist customers in food conservation.

A few more than 100 ranges were sold. Most of these were scattered around through the city, so that in every community there is a range to whose owner persons in that community can be referred. Ninety-nine per cent of the ranges sold have remained and the customers are very well satisfied. W. S. Heald, manager of the commercial service department, states his belief that the hardest work of all is to keep the ranges sold, but he feels that his company has been successful in this.

TECHNICAL THEORY & PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Magnetic Pull in Electric Machines.—E. ROSENBURG.—In this article a mathematical and graphical discussion of the effects of unbalanced pull on the design of electrical machinery is given. The author states that the mechanical parts of a multipolar machine, whether its winding is provided with equalizing connections or not, should be designed strong enough to withstand the pull produced if only one-half of the machine is magnetized to full saturation of the iron. Under normal working conditions a certain reduction of one air gap and an equal increase of the diametrically opposite air gap cause in multipolar machines a readily calculated unbalanced magnetic pull per square centimeter which has a maximum value for a comparatively low state of saturation. For higher saturation the unbalanced pull falls off. In bipolar machines the unbalanced pull has different values for displacement in the direction of the field axis and at right angles thereto, while in multipolar machines the total unbalanced pull for a given displacement of rotor and stator centers is independent of the rotor position. The magnetic pull caused by a displacement equal to the "gravity deflection" of the shaft must not exceed one-sixth of the rotor weight. The author also states that the critical speed is lowered by the unbalanced magnetic pull and varies with changes in excitation. For the greatest permissible value of unbalanced pull mentioned in the preceding rule the reduction of critical speed amounts to 18 per cent.—*Proceedings A. I. E. E.*, September, 1918.

Lamps and Lighting

Comparison of Lighting Units.—WARD HARRISON.—In the comparison of lighting equipment for offices, the writer states that open reflector units are not suitable for large general offices from the standpoint of brightness, specular reflection or shadow. A single direct-lighting unit, if of large area and low brilliancy, would be satisfactory for one person alone in an office if so placed as to bring the light over the left shoulder. It should be designed to illuminate the surroundings to a fair intensity. He states that semi-inclosing units are preferable to open-reflector units for office and drafting-room lighting. It is important that they be of large size and that the density of the glass bowl be such that they are satisfactory from a brightness standpoint. The legitimate field for light-density semi-indirect units as applied in office lighting is extremely limited, depending upon the condition of the ceiling and reflecting walls. Semi-indirect units of dense glass and totally indirect units are, in general, preferable to all others for office lighting where a ceiling of good reflecting power is obtainable. The author points out the importance of the proportions of the room to be lighted, the reflecting power of the ceiling and walls in the utilization and the necessity of keeping reflectors and bowls clean. In conclusion a table is given showing the coefficients of utilization for various types of reflector units and for walls and ceilings of different character.—*Central Station*, September, 1918.

Generation, Transmission and Distribution

Mercury-Vapor Rectifiers.—In this paper may be found an extensive discussion of the efficiency of rectifiers for two-phase, three-phase and six-phase installations. Curves show the variation of efficiency for different conditions of load. The fall of potential in various parts of the circuit is also calculated. Numerous oscillograms of current and voltage waves in different parts of the apparatus are shown. The rectifiers under test are illustrated but not described in detail.—*Schweizerische Bauzeitung*, Sept. 28, 1918.

Load Division Between Synchronous Frequency Changers Which Operate in Parallel—II.—QUENTIN GRAHAM.—Consideration is given to the conditions that must exist when two or more synchronous frequency changer sets are to operate in parallel from both ends. Parallel operation of machines having similar characteristics and those having dissimilar characteristics is discussed.—*Power*, Oct. 22, 1918.

Water-Power Development in France During the War.—HENRI CAHEN.—Report made by the author, who is the head of the Motor Power Service in the Ministry of Armament and War Manufactures, to a recent general congress of the Society of Civil Engineers of France. To the 750,000 hp. produced by water power before the war there has been added under government auspices 850,000 hp., in use or soon to be available, divided geographically as follows: Alps, 428,000 hp.; Pyrénées, 185,000 hp.; central plateau, 200,000 hp.; Jura and Vosges, 35,000 hp.; western district, 2000 hp. This power will be divided as regards its employment between transmitted energy, to which 308,000 hp. is allotted; electrochemistry, 216,000 hp., and electrometallurgy, 326,000 hp. The total capital investment is placed at 660,000,000 francs.—*Revue Générale de l'Electricité*, Sept. 14, 1918.

Sawmill Refuse as a Central-Station Fuel.—R. U. MUFFLEY.—The writer describes tests of furnaces using "hog" fuel, which consists of sawmill refuse after it has been put through a machine which shreds and grinds it. It is said that in plants in the Northwest using fir sawmill refuse boilers may be worked up to 100 per cent above rated capacity, and that such tests indicate the usefulness of the fuel for handling of peak loads. Curves are given showing comparative costs per horsepower-hour for coal, hog fuel and oil at various prices. A description of the furnaces and fuel-handling apparatus follows. The author points out that care should be taken to see that a constant supply of

fuel is in reasonable prospect, since the output of the mill may fluctuate seriously from time to time.—*Stone & Webster Journal*, August, 1918.

Energy Losses in High-Tension Lines.—F. HOPPE.—The present necessity for economizing materials makes it necessary to permit greater energy loss in lines, notwithstanding the loss in commercial economy. Limitations will mainly be set by the permissible voltage drop and magnitude of the corona losses. The investigations have the object of determining what percentage energy losses should be allowed in transmission. Conductors are calculated for a definite maximum load. This sets a lower limit to the section of the wire if the heating of the conductors is not to become excessive. Sufficient tensile strength should be allowed, and the corona losses should not become too great. Moreover, an upper limit to the section of overhead wires is set by the practical difficulty of suspending wires above a given section. The greatest possible sections are 120 mm. to 150 mm. for copper or iron and 240 mm. to 310 mm. for aluminum. In many cases in which a transmission is required over distances not too great a saving of material can be effected by using cables instead of overhead wires, as smaller sections are then permissible.—*Science Abstracts, Section B*, Aug. 31, 1918. (Abstracted from *Elektrot. Zeits.*, 39, April 18, 1918.)

Installations, Systems and Appliances

Airplane Motor-Ignition Systems.—B. Z. REITER.—This article deals with the ignition of airplane engines both by means of magneto and battery systems. It is somewhat simplified for the use of mechanics preparing to go into the government service. The paper is replete with well-chosen illustrations.—*American Machinist*, Oct. 17, 1918.

Electrophysics and Magnetism

Some Two-Dimensional Potential Problems Connected with the Circular Arc.—W. G. BICKLEY.—The velocity potential and stream functions for circulatory flow about an infinitely long lamina in the form of a circular arc and for the disturbance of a stream due to such a lamina were determined in a previous article. It is now proposed to give drawings of the stream lines in the latter case, to examine the case of rotation of the arc, and to give a brief discussion of the motion of the arc when free to move and acted upon by the consequent fluid pressures.—*Philosophical Magazine and Journal of Science*, September, 1918.

Electrochemistry and Batteries

Electrodes for Electric Furnaces.—JEAN ESCARD.—This is the first of a series of articles translated from the French and originally published in *Le Génie Civil*, Vol. 71, Nos. 5, 6 and 7. In the first article there appears a discussion of the raw materials required for the manufacture of electrodes. The manufacturing process of making the electrodes and the physical requirements for successful use are given.—*General Electric Review*, October, 1918.

Aluminum and Its Light Alloys—V.—PAUL D. MERICA.—The composition of duralumin, a remarkable light alloy of aluminum, is given in this article. This alloy is said to respond readily to heat treatment. In its hardened condition the volume conductivity is said to be 35 per cent of that of copper and the melting point is about 650 deg. C. Data are presented showing the mechanical strength made possible by heat treatment. The resistance of the alloy to corrosion is said to be remarkable. Properties of other lighter alloys of aluminum are also discussed in this article.—*Chemical and Metallurgical Engineering*, Oct. 15, 1918.

Telegraphy, Telephony and Signals

Development of Police Signal Systems.—JACOB GRIMM.—After tracing the development of telephone and telegraph signaling systems in considerable detail, this paper gives attention also to repair and maintenance of such systems and points out possible developments in the line of safeguarding the secrecy of this signaling.—Paper before convention of Municipal Electricians at Atlanta, Ga., September, 1918.

Radiotelegraphy.—L. W. AUSTIN.—For the measurement of current of radio frequency the author proposes an arrangement of apparatus called "shunted contact detector." He says the sensibility of this arrangement is much greater than that of the best vacuum thermo-elements of equivalent resistance.—*Journal Washington Academy of Sciences*, Oct. 19, 1918.

Miscellaneous

Electrical Developments After the War.—In a recent popular lecture C. H. Wordingham, president of the (British) Institution of Electrical Engineers, referred to the manufacturing side of the electrical industry after dealing with the problem of electricity supply. With the uniformity of pressure which a unified system such as that proposed would bring about there would come a greater standardization of apparatus. This would permit the British manufacturer to enter more readily into the competition for foreign trade. In his judgment, although there would be room for a few very large firms, Great Britain could get the best results if in addition to those large firms there was a combination among relatively small firms to get orders which would then be farmed out to the individual concerns.—London *Electrician*, Sept. 13, 1918.

Use of Electrical Current to Raise the Temperature of the Body in the Treatment of Disease.—E. P. CUMBERBATCH.—The author points out that if direct current penetrates the skin by way of an electrode 1 sq.in. (6.4 sq.cm.) in area the pain becomes unbearable with a current strength of 15 milliamperes. By the use of high-frequency current at a frequency of 50,000 alternations per second, however, there is no perceptible stimulation of the tissues. The density of the current can then be increased to a value which could not be tolerated in case of direct or low-frequency alternating current. A description of the apparatus for the production of this high-frequency current is given. An application to various diseases is described.—*Journal (British) Institution of Electrical Engineers*, June, 1918.

Electricity Supply of Archangel.—In this article the background surrounding the design and construction of an electric power station for Archangel is given. Although the city is one of 45,000 inhabitants, it is found that three three-phase turbo-electric generators of 500 kw. each suffice to carry the load.—London *Electrical Review*, Sept. 27, 1918.

Scientific and Industrial Research

(PRINTED IN THE THIRD ISSUE OF EACH MONTH)

A Department Devoted to Reports of Investigations Contemplated or Completed, Research Facilities Available, and Suggestions for Coöperative Work.

Conducted by PROF. VLADIMIR KARAPETOFF

Cornell University, Ithaca, N. Y.

RESEARCH COUNCIL WANTS TO GET INFORMATION ON LABORATORIES

It Is Desirous to Aid the Government and Further the Welfare of the World Through the Advancement of Industry and Science

The Engineering Foundation and National Research Council are coöperating in compiling information about the research laboratories of the country and in promoting industrial research. The purpose is to aid the government and the industries in war work and to further the welfare of the world through the advancement of American industry, engineering and science. To do this they request all laboratories which have not yet done so to send to the New York office of the Engineering Foundation, 33 West Thirty-ninth Street, a brief statement covering:

(a) *Equipment.*—Not a detailed list, but a summary indicating kinds and capacities in a general way and mentioning apparatus of unusual character or size.

(b) *Research Work.*—General kinds, with reference, if permissible, to special problems which would indicate the scope of the work which the laboratory can undertake.

(c) *Staff.*—Classes, such as chemists, physicists, engineers, assistants; number of each; name of person in charge, and research time—all, half, one-third or other approximation.

[Much of the information requested, in so far as electrical science and industry are concerned, has been published in the Research Section of the ELECTRICAL WORLD, which has appeared in the third issue of each month, begining with the issue of March 17, 1917. It may be found under the headings of "Apparatus Available" and "Research in Progress." Any one interested, say, in "dielectrics" could easily locate this heading in the former issues and find out not only the places where research on this subject has lately been done but the names of the investigators as well. The items can be conveniently cut out and pasted on cards for ready reference.—EDS.]

Research in Progress or Completed

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Technical Theory and Practice" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

ALUMINUM, RESISTIVITY.

A series of accurate measurements have been made on the resistivity and temperature cofficient of commercial aluminum. This investigation is part of the work undertaken by the International Electrotechnical Commission for the standardization of specifications on industrial aluminum.—*Laboratoire Central d'Electricite, Paris, France.*

CABLES, HEATING OF.

Our chief investigation has been on the heating of buried cables. This work is in a measure completed, and an interim report has been presented to the (British) Institution of Electrical Engineers, but not yet published. Meanwhile it has been decided to include in the inquiry a determination of the dielectric losses in the cables. The cables are laid direct in the ground, solid in bitumen, or drawn into a sixway duct of stoneware. The laid cables are heated by alternating currents, and the increase in the resistance of the conductors is measured by means of a Kelvin double bridge. To make the use of galvonometers possible, a small continuous current of about 20 amp. from a battery is superimposed upon the heavy alternating currents of 500 amp., the accumulators being put in series with the secondary winding of the transformer and with the cable by a double-pole change-over switch. For further details see London *Engineering* of August 2, 1918, page 122.—*S. W. Melsom, H. C. Booth and Miss V. Cockburn, National Physical Laboratory, Teddington, England.*

CAMERA FOR RAPID SUCCESSIVE EXPOSURES.

A camera with twenty-four lenses has been developed that will make twenty-four successive images at a maximum rate of 500 per second. The focal-plane shutter consists of a long curtain, and when operating it uncovers each lens in succession. An electrically actuated trigger for the setter starts it just before the phenomenon to be recorded begins. Numerous investigations of arcs have been made by means of this camera and have resulted in improvements in oil switches, circuit breakers, rotary converters, transformers, etc. The camera may also be readily adapted to the study of spark-gap discharges, insulator flashovers, cable breakdowns, transformer coil displacements, busbar movements, gas-engine operation, rifle and gun displacements, golf positions, etc.—*Capt. Chester Lichtenberg, Washington, D. C.*

COMMUTATOR MOTORS, POLYPHASE.

Some time ago the writer developed a kinematic device for imitating the performance of a polyphase series-wound commutator motor. The device has been named the "secomor" and described in the A. I. E. E. *Proceedings*, 1918, page 65. An addition to this device has been recently developed which permits taking into account the magnetizing current and the leakage impedance of the transformer through which current is supplied to the armature of the motor. At start and at speeds remote from synchronism the transformer affects the characteristics of the machine to quite an appreciable extent, and the addition of this attachment to the secomor was urged by practical designers of such machines.—*V. Karapetoff, Cornell University, Ithaca, N. Y.*

CONTACTORS, OXIDATION OF WORKING SURFACES.

During the past two years the standards committee of the A. I. E. E. has been endeavoring to fix the proper temperature rise for circuit breakers, contactors, switches, etc. The general statement was made by the circuit-breaker engineers that after a circuit breaker had been in operation for several weeks the contacts tended to oxidize, which increased their temperature. This process being cumulative, excessive temperatures would be reached and the contacts injured. For this reason the circuit-breaker engineers recommended a low temperature rise. On the other hand, controllers are used ordinarily for intermittent duty, and therefore little or no trouble from oxidation has developed. The writer had some tests made to try to determine at what temperature oxidation had an active effect on the contacts. Owing to factory limitations, these tests did not exceed eight hours' duration, but some of the contact temperatures measured by a thermocouple reached from 200 deg. to 300 deg. C. No apparent effect from oxidation was observed. Several applications of controllers require a continuous operation for two or three months. A few tests on such applications showed no appreciable effect from oxidation, although the temperatures were considerably in excess of that recommended by circuit-breaker engineers.—*H. D. James, Pittsburgh, Pa.*

INSULATING MATERIALS FOR MAGNETO DISTRIBUTERS.

Important investigations have been made on some insulating materials with special reference to their use in magneto distributers. The insulation of these distributers has to be very durable, since brushes rub over the contact pieces embedded in the insulation. Ebonite and special insulating materials have been tested for mechanical and electrical properties, including tendency to carbonize with sparking. Mica condensers have been examined to test the effect of traces of air in the mica.—*National Physical Laboratory, Teddington, England.*

LAMPS, INCANDESCENT, TUNGSTEN.

A complete and almost universal substitute for carbon and "Gem" lamps would be provided if a tungsten filament very much more robust than the present product were available. It is understood that manufacturers are now actively at work on this problem, and the outlook for its solution seems hopeful. —*From a statement of incandescent lamp manufacturers to the United States Fuel Administration.*

LAMP SOCKETS, VENTILATED.

At the request of the engineering standards committee, measurements have been made of the temperature in ventilated and unventilated sockets of "Goliath" lamps and other lamps used in lanterns of the open and inclosed types. There is considerable heating in the sockets owing to the conduction of heat from the bulbs, and it was found that the temperature in the leading-in cables might rise to 140 deg. C. and that the existing arrangements for socket ventilation did not afford much relief.—*C. C. Paterson, A. Kinnes, J. W. T. Walsh and Dr. Norman Campbell, National Physical Laboratory, Teddington, England.*

MEASUREMENT OF VOLTAGE OF POTENTIOMETER PRINCIPLE.

A new instrument has been developed for measuring small voltages without the extraction of any current from the circuit being measured. The voltage to be measured is balanced against part of the drop of potential of a small battery. The zero point on the scale of a low-resistance voltmeter is used as a galvanometer. By a shift of circuits the source being measured is entirely disconnected and current from the battery

flows through the voltmeter and deflects it to a point on the scale indicating the true voltage of the source at the moment of balance. This is possible because the current from the battery is caused to be the same before the shift of circuits, and this current is directly proportional to the voltage drop over which the balance is obtained.—*E. E. Northrup, Princeton University.*

PORCELAIN, STUDY OF MIXES.

While it is well-known that practically all wet process electrical porcelains in America are made from essentially the same elements in various proportions, frequent claims appear regarding some electrical porcelain of unusual characteristics. It was decided to explore a certain area of the triaxial diagram (flint, feldspar and clay) to see just what mixes would be best suited for high-tension electrical porcelain. The most important properties are dielectric strength, mechanical strength and resistance to temperature changes. Moreover, the body should not deteriorate under service conditions because of moisture absorption, etc. Comparative values of the characteristics—namely, workability in the wet state, translucency, color, vitreous fracture, dielectric strength, mechanical strength and resistance to local heat—were obtained from samples of these mixes. With mixes containing one kind of clay and within a certain range the workability in the wet state varies directly with the clay content, the translucency varies indirectly with the clay content, the color whitens with the decrease of the clay content. The vitreous fracture varies from a very conchoidal fracture to an irregular fracture with mixes of no flint to high flint content. The dielectric strength increases directly with the feldspar content. Mechanical strength increases directly with the flint content and the resistance to local heat increases directly with the clay content. In general, the maximum value of all three principal characteristics cannot be obtained in one body mix. However, a maximum value of any one or possibly two characteristics may be obtained. The problem, therefore, becomes one which should be based upon a consideration of the proportional importance of each characteristic in resisting deterioration of the commercial product. For the numerical data and triaxial diagrams see the *Electrical Journal, March,* 1918.—*Klinefelter and Gilchrest, Pittsburgh, Pa.*

PYROMETER, FOR MOLTEN STEEL.

Under the chairmanship of Dr. G. K. Burgess of the Bureau of Standards, a special committee of the National Research Council is being organized to develop a pyrometer for determining the temperature of the molten steel in the open-hearth and electric steel processes.—*G. E. Hale, Washington, D. C.*

STEEL, MAGNETIC.

Messrs. Thomas Firth & Sons of Sheffield have supplied a set of graded tungsten steels. The magnetic behavior of these steels showed discrepancies apparently due to their antecedent thermal and mechanical treatment. It is intended to prepare definite alloys from the pure materials in the electric furnaces of the laboratory and to examine them magnetically in the ingot and after forging and heat treatment.—*Dr. W. Rosenhain, National Physical Laboratory, Teddington, England.*

STEEL, THE INFLUENCE OF HEAT TREATMENT ON.

Experiments are in progress on the correlation of electric and thermal properties of steel in the light of the solution theory if accepted in the full sense of the term. Experimental evidence has been obtained to prove that total electrical resistivity is made of two components, that due to the solvent and that due to the carbides in solution, the effect of the latter being proportional to their concentration. Electrical conductance is almost entirely through the solvent, while frequently as much as 80 per cent of the total electrical resistivity is due to the solutes. Experiments were made on bars 6 mm. square by 15 cm. in length, carefully annealed, and also quenched under definite conditions. Electric resistivity was measured by the drop-of-potential method, thermal conductvity by means of copper-constantan thermocouples. The preliminary results show that the relationship of the two resistivities is approximately a straight line, although departing from the Wiedeman-Franz law for pure metals. Apart from its theoretical significance, the investigation promises to be of importance in the manufacture and testing of steel wire used for telegraph and electric power, transmission, conductor, rails, etc. The results are published from time to time in the *Journal* of the Iron and Steel Institute.—*E. D. Campbell, University of Michigan, Ann Arbor, Mich.*

TELEPHONE LINES, INDUCTIVE INTERFERENCE.

A theoretical study has been made of the effect of various arrangements of telephone wires on cross-talk and inductive interference from power circuits. The arrangement of the circuits in pairs, with the wires of each circuit at the opposite ends of the diagonals of a square, appears to afford a large reduction of these effects, with a simplification of the transposition system, especially in phantoms formed on these circuits. The idea is not new but seems to have a value in connection with the phantomed circuits which it did not have before these circuits were introduced. The disadvantages are the increased effect of irregularities in sag adjustment on the balance of the circuits and the slightly increased capacitance of the phantom circuits. While the initial cost of construction of a new line need not be higher than for standard practice, the cost of converting an existing standard line into the proposed form would be considerable. It is the intention to publish the complete results shortly.—*William W. Crawford, Department of Physics, Colorado College, Colorado Springs.*

WELDING, ELECTRIC, SPOT.

In view of the great importance of electric welding in shipbuilding, investigations were undertaken to answer the question whether spot welding could be successfully accomplished using steel plates 1 in. (25 mm.) thick. An experimental apparatus of large size was erected and put into operation, the results showing that no difficulty was encountered with 0.5-in., 0.75-in. and 1-in. (6-mm., 18-mm. and 25-mm.) steel plates. In fact, this experimental machine was successful in welding three thicknesses of 1-in. plate, a condition which far exceeds the requirements of merchant-ship construction. This operation has its historical significance in that this was the first time that any spot welding of this magnitude had been performed. The successful outcome of these experiments has led to the design and construction of large spot welders for use in the fabrication of ship sections. Further investigations are being made and designs are being worked out for special spot welders for use in the construction of bulkheads.—*H. A. Hornor in A. I. E. E. Proceedings,* 1918, *page* 1187.

WELDING, ELECTRICAL ARC PROCESS.

Extensive investigations, for use in building ships, are under way on electrically welded joints of 0.5-in., 0.75-in. and 1-in. (6-mm., 18-mm. and 25-mm.) steel plates, to determine their mechanical strength and the ability to withstand live loads and bending.—*H. A. Hornor, A. I. E. E. Proceedings,* 1918, *page* 1188.

Suggestions for Research

BRUSHES, CARBON AND COMMUTATOR WEAR.

Carbon manufacturers, as well as manufacturers of dynamo-electric machinery, have made numerous tests to determine contact resistances, friction losses, etc., of various grades of carbon brushes. Such tests, while of interest, contribute little toward the real practical need, namely, a carbon brush which can stand high current densities and high sparking voltages with small wear. In order to develop such carbons, it would seem essential first to make tests on how the carbon wear is affected by current density, sparking voltage and peripheral speed. Present indications are that with many commercial carbons quite considerable current densities can be used if there is no sparking voltage, while sparking voltages up to 15 volts or even 20 volts across the brush cause very little wear at certain speeds if the current density is low enough. More data on this subject would be of great benefit both to the carbon manufacturer and to the designing engineer.—*R. E. Hellmund, Pittsburgh, Pa.* [In usual tests with collector rings the brush is not operating under the conditions corresponding to a commutator with separate segments, and such essential factors as a non-uniform and fluctuating current density, sparking voltage, etc., are absent. On the other hand, tests on actual direct-current machines are of little value because the foregoing factors cannot be varied at will or accurately measured. What is needed is a new experimental arrangement that would enable one to obtain any desired combination of the important factors in measurable quantities and a rational theory of the phenomena in the short-circuited coils, including the brush contact.—*Editor.*]

CABLES, DIELECTRIC LOSSES IN.

A start has been made in the matter of preparing specifications covering dielectric losses in cables. Engineers of some of the principal cable manufacturers have agreed to coöperate. Before such specifications can be formulated, at least two fundamental points must be considered and agreed upon: First, data must be collected showing the limits of the losses; second, a standard method of making tests must be established. Very few even of the cable manufacturers are equipped for measuring dielectric losses, and probably no users of cables have facilities for properly making these measurements. Some very much simpler and more easily workable apparatus than is now available must be developed before commercial routine tests of this kind can be applied to the output of the cable factories. If a portable testing set for measuring dielectric loss were devised, it could be used to test newly installed cable as well as to secure experimental data on old feeder cables under various conditions of age, temperature, charred insulation, etc. —*A. I. E. E. Committee on Transmission and Distribution.*

COMMUTATOR MOTORS, POLYPHASE.

From the discussions on alternating-current commutator motors it appears that little is known about the possibilities of the polyphase commutator machine. The available literature in English is so meager and the methods of attack of the various writers are so radically different that some one who knows the subject and who also knows how to present it should work up the existing material into a comprehensive treatise for publication.—*A. I. E. E. Committee on Electrical Machinery.*

CORROSION, ELECTROLYTIC PROTECTION AGAINST.

Corrosion of steam condenser tubes, boilers, etc., is now considered to be due to an electrolytic action, and a reasonable degree of protection has been obtained by circulating an electric current in the right direction to counteract oxidation. Much remains to be done in this field of endeavor, both in obtaining accurate data and also in perfecting the mechanical details of the method, for use on a large scale and under various conditions of service.

HEATING OF REVOLVING PARTS.

Thermocouples and resistance thermometers are used for recording the temperature rise in stationary parts of electric machines, but it is desired to develop similar apparatus for recording at a distance the temperature rise in revolving parts, say in the field windings of a turbo-alternator. No slip rings or gliding contacts must be used, and any electric or magnetic action of the detector must be transmitted to the stationary leads by induction or some such means.

SKIN EFFECT IN BUSBARS.

As a general principle it might be presumed that all conductors of a certain proportionate shape and at a certain value of f/R will have a definite value of R'/R, where R is the direct-current resistance, R' is the alternating-current resistance, and f is the frequency. This is true of the tubular form, the skin effect of a tube of a certain ratio of thickness to diameter and of any size being given by a single curve. The principle has not been proved to be true for a thick strap, but it seems probable that it applies to that case also, and to built-up ventilated busbars. For approximate results only the outside dimensions of ventilated busbars would need to be considered, and the busbars would be treated like very thick rectangular conductors of low conductivity. The above principle could easily be verified experimentally, and, if true, it would greatly simplify the measurement of skin-effect values and the plotting of curves for practical use. A simple extension of existing curves for various proportionate thicknesses would then show the approximate skin effect of any isolated rectangular conductor, whether solid or ventilated, hot or cold, large or small, and whether copper or aluminum. Such a set of curves would be useful in designing heavy busbars and conductors, not placed close together*.—*H. B. Dwight, Hamilton, Ontario.*

*These statements were taken from Mr. Dwight's paper on "Skin Effect in Tubular and Flat Conductors," *A. I. E. E.*, 1917.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

ELECTRIC MOTORS IN THE CEMENT INDUSTRY

Discussion at A. I. E. E. Meeting in New York Follows Plan of the Committee on Industrial and Domestic Power

In accordance with a plan chiefly credited to Capt. E. H. Martindale, formerly chairman of the committee on industrial and domestic power of the American Institute of Electrical Engineers, papers are to be presented from time to time, as a result of the activities of this committee, giving studies of the power requirements of specific industries.

On Nov. 8, at the three hundred and forty-third meeting of the A. I. E. E., held in New York City, such a paper was presented by R. B. Williamson of the Allis-Chalmers Company, entitled "Electric Drive in the Cement Industry." The processes of cement manufacture were outlined and data were presented to show sizes and types of motors required for driving the machinery.

Many prominent men, particularly from the manufacturing companies, were present to discuss the paper. Prof. C. A. Adams, president of the A. I. E. E., occupied the chair.

WIDER USE OF METRIC SYSTEM IS RECOMMENDED

International High Commission Seeks to Have Congress Make Use of This System Obligatory in United States

More extensive use of the metric system in the trade and commerce of the United States is recommended in a resolution adopted by the United States Section of the International High Commission, of which Secretary of the Treasury McAdoo is chairman. The resolution is as follows:

> The United States Section of the International High Commission, having in view the present efforts to bring about the exclusive use of the metric system of weights and measures within the jurisdiction of the United States, resolves:
>
> 1. That in the opinion of the section the adoption of that system would be productive of great advantage in the commercial relations of the United States with the other American republics.
>
> 2. That the secretary of the section be directed to communicate a copy of this resolution to the chairman of the proper committees of the Senate and the House of Representatives.

The United States Section of the International High Commission received legal recognition by act approved Feb. 7, 1916. Its chief function is to bring about greater uniformity and a more liberal spirit in the commercial law and administrative regulations in the American republics and more stable financial relations between Latin America and the United States.

It is, of course, unnecessary for the United States Section to recommend to the Latin-American Section of the commission anything in connection with the metric system, which is exclusively in use in Latin America. At present the use of the metric system is not obligatory in the United States, so that documentary uniformity is lacking. Of more importance than statistical and administrative questions, however, is the use of the metric system in trade. Of the great nations of the world only the English-speaking nations have still to adopt the metric system of weights and measures, and Great Britain seems to be giving serious consideration to the necessity of making a change. The subject has now assumed a most practical character in the minds of those who are planning for post-war trade expansion.

WATER-POWER DEVELOPMENT TO BE AN ISSUE IN MAINE

Public Policy Expected to Be at the Forefront in 1919 Session of the Legislature—Report on State's Resources

Water-power development as a public policy is expected to come to the front at the 1919 session of the Maine Legislature, following a quiescent period in the discussion of state policies.

An exhaustive report on the resources of the state with respect to hydroelectric and storage facilities is now approaching completion in the hands of the Public Utilities Commission under the direction of Paul L. Bean, chief engineer of the board. This volume, which is to cover over 600 pages of data and discussion of great technical, economic and legal interest, will set forth the physical facts regarding the water-power resources and possibilities of the principal rivers in Maine in one of the most comprehensive studies ever made in this field, and it is planned to have it on the desk of every legislator at the opening of the 1919 session.

The report will not deal with questions of policy, but will afford an engineering basis for any legislation which may be deemed necessary. The possibilities of interconnection will be indicated in the report on a map showing all the principal transmission systems and plant locations in the state. An important section will deal with the market for hydroelectric energy and the limitations of the latter as well as probable and actual costs of development for commercial use.

It is expected by those conversant with political conditions in Maine that the old question of state ownership and development of water powers will again be agitated in 1919, although nothing in the September election indicated strong sentiment against private ownership.

PROGRESS IN RECONSTRUCTION

LOOSENING of the restrictions of the War Industries Board on the manufacture of electrical supplies is reported on page 950 of this issue.

Dr. Garfield has modified the lighting restrictions. His order is printed on page 949.

The National Committee on Gas and Electric Service is still representing the utilities at the national capital. It has been suggested that this committee be continued during the reconstruction period or for such time as its contact with the Washington authorities is found to be in the interest of the companies and the public and of service to the government departments with which it maintains close contact.

A plan for the work of the electrical manufacturers' organizations in the reconstruction era is being considered carefully and it is expected that it will be matured at an early date.

OUTLOOK IN RECONSTRUCTION AS IT IS SEEN IN CHICAGO

Report from the Middle West on the Factors Which Will Probably Determine the Condition of the Industry

Even before rumors were received that the armistice was signed the Middle West had begun to ask itself, "What will be the effect on the industry?"

In the first place, it is apparent that the government will not be out of the market for capital until after next April. There will be another Liberty loan "to get the boys home." But after April there will be an opportunity to raise capital without competing with the government. In fact, in the fall there should be available a considerable amount of reasonably priced money. Americans have now been taught to save and to invest. So the latter half of 1919 ought to see a large amount of utility financing.

The necessity for it can almost be passed without discussion, for there are few companies that have kept their reserve line, substation and station capacity as far ahead of the demand as is customary. There are a few exceptions to this, of course, in cities where war work has necessitated extraordinary expansion. In the main, however, the period of the war has been a period of makeshifts. The whole effort has been to get along with whatever was on hand. These makeshifts will not endure long when peace is in sight. To do away with them and to get the plant capacity a safe distance ahead of the demand again will take capital. This work can hardly be expected to create anything in the nature of a boom, because, in some of the large cities especially, the usual rate of general growth of the utilities has not been maintained owing to curtailment of building. It should, however, be of generous proportions.

Getting the labor depends on the government's policy of demobilization and on the general policy of the large industries. War plants which have employed the highest-priced labor will no doubt release some of it. That will create a certain supply, but not a large one, and will tend to lower labor prices. Steel mills have enough orders on hand and in prospect to keep going at top speed for many months. The shipyards will continue with their program for producing enough tonnage to sustain an army of 5,000,000 men abroad. So it appears that until actual releasing of the army begins labor will not be in appreciable supply. Moreover, as long as food and clothing prices remain at present levels the wages of labor will not recede far. Common labor, however, will no doubt go back to $2.75 or $3 a day in a reasonable time.

How the demobilization will be handled has not been announced. It is safe to assume, however, that the United States will "play safe." She will probably maintain an army of millions abroad until peace negotiations have been actually completed. It will be remembered that during the late stages of the Philippines campaign troops were replaced with fresh contingents after they had spent six months in the islands. Following this policy again after the signing of an armistice would somewhat delay demobilization. On the other hand, immediate release of men in camps on this side of the water would create a labor supply quickly—too quickly perhaps. This is hardly to be expected. In any event

DEMOBILIZATION WILL GIVE THESE MEN BACK TO INDUSTRY

it is believed that a reasonably adequate supply of labor will be available at prices within reach by the time capital can be secured to make use of it.

As to the trend of central-station loads, no fear is expressed. It is, of course, expected that there will be some lull in certain industrial plants. But the enthusiastic energy and resourcefulness of the American manufacturer can be relied upon to find ways and means of keeping the majority of the wheels turning. He has never yet been known to sit back in idleness simply because the immediate job he was doing had come to an end. Releasing restrictions on lighting will add to electric loads. Commercial effort on the long-neglected domestic appliance market will help. The beginning of manufacturing of new devices will start. Evidence of these in the electrical field are numerous. New lines which are ready for announcement are of all sorts. They include everything from sockets to steam turbines.

So, on the whole, the outlook for the utilities in the Middle West is bright. They have weathered a severe storm. Some have had assistance through higher rates. Some have "lived on their fat." None is prostrate. The outlook for the industry during the reconstruction period appears, therefore, to be entirely satisfactory.

Facing the Reconstruction Problems

As the Outlook Is Seen in Statements to the "Electrical World" by W. F. Wells, F. G. Sykes, Alex Dow and W. S. Barstow

Promote the Revival of Peace Industry

BY W. F. WELLS

President National Electric Light Association

THE enemy of civilization and liberty has given up his arms. He has been overpowered by the greatest armed force ever assembled on the seas, on the land and in the air. The result has been attained by the combined efforts of twenty-three million men, serving under the colors of twenty-four nations. The particular part accomplished by the members of the National Electric Light Association and the representatives of the electric light and power industry has been to maintain their service to the public and to supply the great industrial armies with the immense quantities of power required by the government for the construction of ships, docks and government works and the manufacture of arms, munitions, clothing and supplies for the navies and military armies in the field.

With the cessation of hostilities the demands on the industrial army were diminished, orders being issued from Washington on the day following the signing of the armistice to eliminate all Sunday and overtime work in government-owned or controlled plants or in plants producing war supplies. The men thus released from night work should be transferred without loss of time and product to other industries which will form part of the great work of reconstruction and readjustment of civilization.

During the months to come the armies now in the field will be demobilized and returned to their former homes. As this work progresses there must be also a progressive transfer from the industrial war army to the one of industrial peace. Men taken from farms and from industries which furnished comforts, conveniences and pleasures before the war must be reëstablished in their old pursuits, and parallel with this there must be provided ways and means for the returning soldiers to do their part in the army of civilization. Our comfort, our happiness and our well-ordered existence depend on the smoothness and quickness with which the men released from military and naval service and the supporting war industrial army are transferred to the great peace army of the future.

The work of our members is to plan and promote the revival of industry on a peace basis, and to do this in such a way as to maintain the orderly processes of a self-controlled government.

The Engineer Will Be Called Upon to Bear Great Responsibility

The closing of the world war has left the United States of America a leader among the nations of the earth, not only financially but industrially. Such a proud position carries with it a tremendous responsibility and calls for broad vision and organizing and executive ability of the very highest order. Science and exact methods will play a very important and ever-increasing part in the reconstruction work which is about to begin, and the engineer will be called upon more than ever to bear great responsibility. As yet the American engineer has not been found wanting, and he will not in the great work about to begin.

F. G. SYKES,
President American Power & Light Company.

Electrical Industry Should Take Its Place in Reconstruction

The necessity of reorganizing industry upon a war basis in order to furnish the foundation for military operations has brought about results which otherwise would have taken years to accomplish.

The demonstrated value of the engineer in war time has forced a sudden realization on the part of the public of the value of the same engineer in time of peace. Hereafter a large part in national life, in building up the industries of the country, must be taken by those technically trained in science and organization, and some definite steps should be started at this time to provide that the electrical industry take its place in reconstruction and in all future progress.

W. S. BARSTOW,
President W. S. Barstow & Company.

A Period of Readjustment

There will be a period of readjustment in the country at large. Although certain parts of the war activities will be stopped, it will be necessary to keep an army overseas and an army organization in this country for a year, perhaps more. Supplies will be required for these forces. More Liberty loans and taxes will be necessary, and they will call for economies. Certainly economies in food will be essential.

Detroit has not over-expanded in war work and has little manufacturing equipment, and no housing or labor, which cannot be converted quickly to peace-time production. The transition period in this city, in my opinion, will not last much longer than any of the several intervals of transition through which we passed in getting adjusted to war conditions.

Some people expect to see immediate reductions in wages. That forecast is not based on the lessons of history. The workingman's living standard will never return to the basis of, say, 1896, and in my judgment the level of wages will not be readjusted violently. On the contrary, it is my thought that efficient work will continue to command present wages, but the inefficient and overpaid men will have to readjust themselves to positions which they are fitted to occupy.

ALEX DOW,
President Detroit Edison Company.

POLITICS AND RECONSTRUCTION GETTING MIXED IN WASHINGTON

Spirited Contest Developing in the National Capital Over Government Plans for Control of Reconstruction Measures

BY WINGROVE BATHON
Washington Representative "Electrical World"

Report has been made in these columns recently of the prospect of a great contest in Washington in connection with the reconstruction bills before Congress. Additional bills are being introduced, and the expected fight is developing rapidly, the signing of the armistice with Germany bringing it out into the open, on the ground, Senators say, that the war is over.

Under the circumstances it is perhaps advisable to make an explanation of what is said to be the true political background in Washington concerning the reconstruction measures, so that business men may understand the situation that confronts them in preparing to place industry upon a peace basis and may take such precautions in presenting their views to Congress as seem advisable.

In the first place, doubt has arisen during the past week in well-informed legislative circles in Washington as to whether the Senate will consent to confirm the appointment of Bernard M. Baruch, chairman of the War Industries Board, as a member of a Reconstruction Commission, in case the so-called administration plan of revamping the Overman bill, giving reconstruction powers and duties to the War Industries Board, is carried through, and in case Congress passes the bill, thus making the proposed commissioners its creatures. If a forced vote were obtained from the present Democratic Congress, it is doubtful if later on appropriations could be obtained if Mr. Baruch were to have a controlling voice in their expenditure.

* * *

Doubt is also being expressed in Washington that the Senate will permit the placing, under any bill which Congress passes, of reconstruction powers and duties in the hands of Vance McCormick, chairman of the War Trade Board, who is also chairman of the Democratic National Committee and who has been mentioned as a possible Presidential appointee upon a reconstruction commission. These doubts extend to the members and committees and machinery in part of the two bodies mentioned.

It should be pointed out that these doubts are not personal to the gentlemen mentioned or to their associates, and it should also be pointed out that Senators in many instances share the publicly expressed opinion of business men concerning the good work the war agencies under the direction of Mr. Baruch and Mr. McCormick have done in behalf of business, and also feel that a measure of control of industry immediately following the war will be necessary for a time, if some organizations in business are not to obtain all the coal, raw materials, transportation foreign shipping space, etc., they want, permitting others less fortunate to go without.

But, while these facts are recognized, a storm of opposition has been aroused in the Senate because Mr. Baruch issued a statement in Washington in the past week in which he said that reconstruction plans will possibly come forth in the near future "in the form of suggested legislation." Mr. Baruch is known, just prior to the issuance of this statement and just after a visit to the White House, to have told his colleagues in the War Industries Board that the members and committees of that board would play a leading part in reconstruction. Apparently a number of Senators were not taken into consideration and conference previously, and this has added to a state of mind which has become more and more disgruntled during the past months when Senators have been obliged to sink their personal views and vote in the way the White House has asked or be accused of impeding the prosecution of the war.

This talk is now coming out into the open, and Senators are saying that the war is over and that it shall come out in open debate on the floor of the Senate. That Mr. Baruch has made many enemies, some of them said to be very close to the Presidential Cabinet circle, is now common talk in Washington. This is a report long current among well-informed Washingtonians, and there is no use in mincing words about it, Senators say. On the other hand, equally well-informed Washingtonians are pointing out that some of the opposition—indeed, a very large proportion of it—to granting reconstruction powers to Mr. Baruch and Mr. McCormick arises not so much from opposition to these gentlemen and the war agencies with which they have been associated as from opposition to the President himself.

One of the astonishing points in this situation to non-residents of Washington is that a number of the older Democratic Senators are lining up with the Republicans in their opposition to Presidential plans for after the war, and Senator Martin of Virginia has been one of the first of these. He did not wait a moment beyond receiving assurances that the armistice with Germany would be signed before serving notice in a public statement that he would take no more "orders" as to legislation, that appropriations and taxes must be cut down, going so far as to say that unless the drafting of men and the sending of them unnecessarily to France were halted Congress would pass a resolution requiring the War Department to halt.

Senators are saying now that for more than four years, including the period during the war of a year and a half, and before it when the United States was on the edge of the volcano, Republicans and Democrats alike stood loyally by the President as the first American. But now, they say, the scene shifts, and Republicans as well as a number of Democrats are about to say to the President that the Senate will no longer brook interference, no longer accept orders.

* * *

This changing situation in Washington can best be illustrated by recalling the prediction made by the writer in these columns recently that there was little likelihood of an extra session of the new (Republican) Congress shortly after March 4 next because a Democratic President would probably not call a Republican Congress in extra session. That remains true, but the intimation has gone around now that the Republican Senators as well as the Democratic Senators who are now expected to come out in the open against the White House are very likely to force an extra session of Congress just after March 4 by holding up some of the big appropriation bills such as the Post

Office bill. As the country will still be on a war basis next spring it is said that no effort will be made to hold up either the War Department or the Navy Department bill, but there are many other bills which provide not the sinews of war but the sinews of peace which can be held up to force an extra session. It is pointed out that the President for the remaining two years of his term of office has no more patronage with which to coax, nor has he the war left as a means of whipping recalcitrants into line.

In these circumstances Senators now in Washington who are favorable to quick passage of necessary reconstruction measures so that the business interests of the country may be able to get back upon a peace basis without an interregnum believe that business men would do well to take an active interest in what is going on at Washington in this respect before the prospect of the passage of the bills gets so muddled that it is beyond straightening out. By the time this is published most of the members of the Senate and House will be back in Washington, and then, it is expected, there will be quickly laid plans to develop new ideas on reconstruction or, to take the more hopeful view, plans will be made to keep business standing on its feet.

LESSENED RESTRICTIONS ON "LIGHTLESS" NIGHTS

Text of Dr. Garfield's Modified Order Effective on Nov. 11—Application Different in Various Sections of the Country

New regulations partially removing the present restrictions on the use of light generated by the consumption of fuel, effective on Nov. 11 and superseding all previous orders on the subject, were issued on Nov. 8 by the United States Fuel Administration.

In New England, New York, Pennsylvania, New Jersey, Delaware, Maryland, District of Columbia, Michigan and Ohio the change from the previous order is with reference to the illumination of store or shop windows. Under the new order the store or shop window lighting is only restricted when the store is closed and then only on the "lightless nights" that are specified in the order.

Throughout the rest of the country practically all lighting restrictions are left to the discretion of the state fuel administrators.

The partial raising of restrictions in the East is due to an improvement in the supply of bituminous and steam anthracite coal, but caution must still be observed in that section because of the anthracite and power situation. In the West enforcement of the regulations is optional with the state fuel administrators.

AGAINST WASTEFUL USE OF LIGHT

The new order prohibits the wasteful use of light in streets, parks or other public places in any city, village or town. Its use for illuminating advertisements, announcements or signs, or for the external ornamentation of any building and for displaying any shop window when the shop is not open for business, on Monday, Tuesday, Wednesday and Thursday of each week in New England, Maryland and the District of Columbia must be entirely discontinued.

The order also provides for the entire discontinuance of such use of light Monday and Tuesday of each week in Michigan and Ohio and in any other state where the federal Fuel Administrator shall so order.

A complete copy of the order follows:

It appearing to the United States Fuel Administrator that it is essential, in furtherance of the national security and defense, to lessen and prevent the waste of fuel, and to secure an adequate supply and equitable distribution and prevent, locally and generally, scarcity thereof, and that to these ends it is necessary that the use of fuel shall be limited and restricted in the manner hereinafter set forth, the United States Fuel Administrator, acting under authority of an executive order of the President of the United States, dated Aug. 23, 1917, appointing said administrator, and of subsequent executive orders, and in furtherance of the purpose of said orders and of the act of Congress therein referred to and approved Aug. 10, 1917,

Hereby adjudges that the use of fuel or of light generated or produced by the use or consumption of fuel for any of the purposes hereinafter described, except as hereinafter provided, is wasteful, and that any person using fuel or light for such purposes except as aforesaid is engaging in a wasteful practice or device in handling or dealing with fuel, and that the use of fuel or light for such purposes except as aforesaid is prejudicial and injurious to the national security and defense and a cause of scarcity locally and generally; and said United States Fuel Administrator

Hereby orders that the order of the United States Fuel Administrator relating to the use of coal to generate electricity for the operation of illuminated advertisements, etc., dated Nov. 9, 1917, and the amendment thereto dated Dec. 14, 1917, and the order of said United States Fuel Administrator relating to the use and maintenance of lights in cities, villages and towns dated July 18, 1918, be, and the same hereby are, vacated and set aside as of the effective date of the regulation hereinafter established, and hereby makes and establishes the following regulation, effective Nov. 11, 1918, and until further or other order or regulation in the premises:

REGULATION RESTRICTING THE USE IN CITIES, VILLAGES AND TOWNS OF LIGHT GENERATED OR PRODUCED BY THE USE OF FUEL

Section 1. The extravagant or wasteful use of light generated or produced by the use or consumption of coal, oil, gas or other fuel for illuminating purposes in the streets, parks or other public places of any city, village or town, or for other out-door illumination, public or private, is hereby prohibited.

Section 2. The use of light generated or produced by the use or consumption of coal, oil, gas or other fuel for illuminating or displaying advertisements, announcements or signs on the exterior of any building, or on any billboard or other structure for the display of advertisements, announcements or signs, and the use of such light for the external ornamentation of any building or structure, or for illuminating or displaying any window in any shop or store, when such shop or store is not open for business, shall be entirely discontinued on Monday, Tuesday, Wednesday and Thursday of each week in New England and in the States of New York, Pennsylvania, New Jersey, Delaware and Maryland and in the District of Columbia, and shall be entirely discontinued on Monday and Tuesday of each week in the States of Michigan and Ohio, and in any state not hereinbefore mentioned, when the Federal Fuel Administrator for such state shall so order; provided, however, that nothing in this regulation shall be construed to prohibit the maintenance in any shop or store window of any lights required by a state law or a municipal ordinance, or for the purpose of safety.

Section 3. The Federal Fuel Administrator for each state is hereby authorized and directed to enforce this regulation within such state.

Any person violating or refusing to conform to this regulation will be liable to the penalties prescribed in the aforesaid act of Congress.

War Restrictions Loosened for Industry

Light and Power Utility Construction May Go On, Says War Industries Board—Expansion in Production of Electric Heating and Cooking Appliances, Washing Machines, Electric Vacuum Cleaners and Electric Fans (Including Motors)

THE chairman of the War Industries Board, B. M. Baruch, authorizes the following: The War Industries Board began to-day [Nov. 12] a modification of the restrictions whereby it has controlled American industry in the interest of the nation's war program.

As laid down by Chairman Baruch in a published announcement Nov. 8, it will be the policy of the board gradually to lift various restrictions and curtailments, with the view of bringing about as promptly as possible a return to normal conditions.

In the modification of the curtailments imposed on the manufacture of certain commodities the board has adopted the method of reversing the processes of the Priorities Committee, and there is announced a list of the commodities in respect to which the curtailments are to be modified.

Hearty approval has been given by the Council of National Defense to the modifications of the regulations governing non-war construction, and the council requested that immediate and widespread publicity be given them, so that to the extent now permitted building operations might be speedily resumed.

Following is the formal announcement made by E. B. Parker, chairman of the Priorities Division of the War Industries Board:

WAR INDUSTRIES BOARD—PRIORITIES DIVISION

Circular No. 57

All of the rules, regulations, restrictions and directions embodied in orders and circulars issued by the Priorities Division of the War Industries Board are continued in effect subject to the following modifications:

Section 1. Section 5 of Revised Circular No. 21, issued by this division as of date Oct. 15, 1918, dealing with non-war construction, is hereby amended so as hereafter to read as follows:

"Section 5. *Construction projects not requiring permits or licenses from Non-War Construction Section.*—Construction projects falling within the following classifications are hereby approved, and no permits or licenses will be required therefor from the Non-War Construction Section:

"(1) Construction projects approved in writing by the facilities division of the War Industries Board.

"(2) All farm and ranch buildings, structures or improvements.

"(3) All buildings, structures, roadways, plant facilities or other construction projects of every nature whatsoever undertaken by the United States Railroad Administration, or by any rail or water transportation company, organization or utility (whether or not under the direction of such administration), or by the American Railway Express Company, or by the owner or operator of any telegraph or telephone line.

"(4) The construction, maintenance, improvement or development by federal, state or municipal authorities of highways, roads, boulevards, bridges, streets, parks and playgrounds.

"(5) The construction, extension, improvement, maintenance or repair of any public utility, including water-supply systems, sewer systems, light and power facilities and street and interurban railways.

"(6) The construction, extension or repair of all irrigation and drainage projects.

"(7) Construction projects connected with the extension, expansion or development of mines of every character whatsoever connected with the production and refining of mineral oils and of natural gas.

"(8) The construction, alterations or extensions of, or repairs or additions to, plants engaged principally in producing, milling, refining, preserving, refrigerating or storing foods and feeds.

"(9) The construction of new, or the alterations or extensions of existing, schoolhouses, churches, hospitals and federal, state or municipal buildings involving in the aggregate a cost not exceeding $25,000.

"(10) The construction of new buildings or structures not embraced in any of the foregoing classifications, or the repairs or additions to, or alterations or extensions of, existing buildings and structures, in either case involving in the aggregate a cost not exceeding $10,000.

"(11) The construction of new buildings or structures not embraced in any of the foregoing classifications, or the repairs or additions to, or alterations or extensions of, existing buildings or structures, in either case involving in the aggregate a cost not exceeding $25,000, when approved in writing by the State Council of Defense or its duly authorized representative.

"(12) Buildings begun prior to Sept. 3, 1918, where a substantial portion of the building has already been constructed."

Section 2. All limitations on the production of building materials, including brick, cement, lime, hollow tile and lumber, are hereby removed, and the materials so produced may be sold and delivered for use in connection with any building project for which no permit or license is required under revised Priority Circular No. 21, as further revised by Section 1 hereof, or to any project authorized by permits or licenses issued in pursuance of said circular. All limitations upon the production or use of lime or crushed or pulverized limestone in any form for agricultural uses are hereby removed.

Section 3. Restrictions upon industries and manufacturers in their production of, or in their consumption of materials for, commodities hereafter in this section enumerated, as such restrictions are expressed in orders and circulars issued by this division, are hereby so modified that such restrictions for the respective periods provided for in such several orders and circulars shall be less than the restrictions provided for in such orders and circulars to the extent of 50 per cent of such restrictions; that is to say, where the industry has been curtailed for a stated period a certain percentage of its production or in its consumption of materials, such curtailment for such period is hereby reduced to the extent of one-half of the curtailment expressed in such order or circular. To illustrate: Where an industry for the last four months of 1918 has been curtailed 25 per cent, such curtailment is hereby changed to 12½ per cent for such period; where it has been curtailed 40 per cent such curtailment is hereby changed to 20 per cent, and where it has been curtailed 50 per cent, such curtailment is hereby changed to 25 per cent. The commodities referred to are as follows:

1. Agricultural implements and farm operating equipment, including tractors.
2. Road machinery.
3. Coal, coke and wood-burning, cooking and heating stoves and ranges.
4. Gas ranges, water heaters, room heaters, hot plates and appliances.
5. Oil and gasoline heating and cooking devices.
6. Electrical heating and cooking devices and appliances.
7. Black galvanized and enameled ware and tinplate household utensils.
8. Refrigerators.
9. Ice-cream freezers.
10. Washing machines.
11. Clothes wringers.

12. Family sewing machines.
13. Electric vacuum cleaners.
14. Metal beds, cots, couches, bunks and metal springs for same.
15. Boilers and radiators.
16. Baby carriages.
17. Corsets.
18. Bicycles.
19. Electric fans (including motors).
20. Builders' hardware.
21. Padlocks.
22. Stepladders.
23. Scales and balances.
24. Rat and animal traps.
25. Talking machines (including motors and accessories).
26. Talking-machine needles.
27. Clock watches and clocks.
28. Watch movements and watchcases.
29. Hand stamping and marking devices.
30. Safes and vaults.
31. Lawn mowers.
32. Pottery.
33. Pocket knives and similar products.
34. Linoleum.
35. Rag-felt floor covering.
36. Sporting goods.
37. Glass bottles and glass jars.
38. Tinplate.
39. Pianos, including piano players, automatic pianos and parts.
40. Pneumatic automobile tires.
41. Passenger automobiles.
42. Cash registers.

Nothing herein contained shall be construed to release any industry or manufacturer from the strict observance of the rules and regulations of the Conservation Division of the War Industries Board as applicable to such industry or manufacturer.

Section 4. Dealers (wholesale and retail) in raw materials, semi-finished and finished products are hereby relieved from the obligation to give and require pledges relating to such commodities, notwithstanding any provision for pledges in any order or circular heretofore issued by the Priorities Division, and notwithstanding any stipulation in any pledge that they will require pledges from those who buy from them for resale; provided, however, that building materials and other products shall not be sold and delivered for use in connection with any non-war construction projects save those for which no permit or license is required under Priority Circular No. 21, as revised by Section 1 hereof, or those authorized by permits or licenses issued in pursuance of said circular; provided further, that manufacturers will continue to give pledges in accordance with the terms of orders and circulars heretofore issued and comply with all pledges heretofore or hereafter given, save that they are hereby relieved from the provisions in such pledges that require manufacturers to exact pledges from those who buy them for resale.

Section 5. The Priorities Division of the War Industries Board will, as far as practicable, assist industries in procuring materials, fuel, transportation and labor to enable them to increase their operations to normal limits as rapidly as conditions may warrant. Precedence must, however, be given to stimulate and increase the production of cargo ships and supply the requirements of the army and the navy of the United States, as well as to provide for this nation's proper proportion of the enormous volume of materials, equipment and supplies as shall be required for the reconstruction and rehabilitation of the devastated territories of Europe. Precedence must also be given to such activities as will tend to stimulate the production of foods and feeds, of coal, of natural gas, of oil and its products, of textiles and clothing, and of minerals, and to provide for deferred maintenance, additions, betterments and extensions of railroads, telegraph and telephone lines and other public utilities, and to permit and stimulate the intensive development of inland waterways.

The War Industries Board requests, and with confidence shall expect to receive, the continuance of that whole-hearted coöperation and support of the industries of this nation which it has heretofore enjoyed, and which will make possible the success of so much of the industrial adjustment program covering the period of transition from a war to a peace basis as it is called upon to administer.

In an earlier statement, indicating that as the demand for raw materials is lessened by the reduction of war requirements and the cancellation of war contracts the raw materials so made available will be released and allocated by the War Industries Board for use in supplying civilian and export demands, Mr. Baruch said also:

"The War Industries Board will continue to exercise its functions until the peace treaty is signed, to the end that the readjustment of the matters on which it has been acting may be made in as orderly a manner as possible.

"A committee named by the President has been and is now at work to devise the best mechanism of bringing about the adjustments from a war to a peace basis. The report of the committee may take the form of suggested legislation.

"The whole effect of the readjustment plans will be to the end of bringing about necessary changes with as little dislocation as possible and the full opportunity for all to benefit as in the past by individual ingenuity, vision and fair dealing."

PROGRAM OF THE TORONTO CONVENTION OF A. I. E. E.

Besides the Technical Sessions, an Opportunity to Visit Great Engineering Developments Will Be Given to Visitors

The three hundred and forty-fourth meeting of the American Institute of Electrical Engineers will be held in Toronto, Canada, Nov. 22-23, at the Engineers' Club. Members and guests will assemble at noon at the club, where an informal reception and registration will be held, followed by a luncheon of the reception committee and delegates.

The program follows:

Friday Noon—Reception and registration.

Friday, 1:30 p. m.—Technical session. Opening remarks by President C. A. Adams. "Electric Power Development in Ontario," by Arthur H. Hull, chairman of the Toronto Section and assistant engineer of the Hydroelectric Power Commission of Ontario.

Friday, 3:30 p. m.—Technical session. "Electrical Equipment of the Canadian Northern Tunnel in Montreal," by W. G. Gordon, transportation engineer of the Canadian General Electric Company.

Friday, 6:30 p. m.—Dinner of delegates and members at Engineers' Club. Address by Sir Robert Falconer.

Friday, 8 p. m.—Technical session.—"The 110,000-Volt Transmission Line Over the St. Lawrence River," by S. Svenningson, designing engineer Shawinigan Water & Power Company.

Saturday, 9:30 a. m.—Technical excursion (alternatives): (a) Leaside munition plant; (b) British Forgings Company electric steel plant; (c) hydroelectric laboratories and 110,000-volt substation.

Saturday, 12:30 p. m.—Luncheon of reception committee and delegates at rooms of the Toronto Board of Trade, Royal Bank Building roof.

Serious Drought Is Now at an End in Georgia

The severe drought from which the Georgia Railway & Power Company, Atlanta, has been suffering is broken. It was the most serious in the history of the company and it occurred when the demand for energy was greatly increased.

It is not expected that further shortage of water will be experienced before next summer, at least, unless winter rains are less than normal.

STATE COMMISSIONERS' MEETING IN WASHINGTON

Report of the Special War Committee Presented at Annual Convention of National Association of Railway and Utilities Commissioners

The National Association of Railway and Utilities Commissioners held its annual convention on Tuesday, Wednesday and Thursday of this week in the rooms of the Interstate Commerce Commission in Washington, D. C. The association includes in its membership the Interstate Commerce Commission and all the railroad and public utilities commissions of the country, forty-seven in all, Delaware being the only state without one. More than twenty-five commissions were represented at the meeting. The program consisted mainly of reports of standing committees, of which there are eighteen.

Winthrop M. Daniels, chairman of the Interstate Commerce Commission, made the address of welcome, following which were the report of the executive committee and the annual address of Charles E. Elmquist of Minnesota, acting president of the association.

The chief paper at Tuesday's session and the most important of the convention was the report of the special war committee, presented by Joseph B. Eastman of Massachusetts. In this it was pointed out that the state commissions have worked in harmony with the spirit and needs of the times. They have allowed and facilitated reductions of service needed for the conservation of labor and fuel by refraining from requirements reasonable under ordinary conditions but wasteful of capital and energy in time of war and by permitting without undue delay or controversy increases fairly demanded by the rapid advances of wages and prices and necessary to relieve utilities of more than their fair share of the burden of war conditions. They have also helped in the conservation and better use of electrical energy and of labor, provided transportation facilities for war industries, coöperated with the Fuel Administration and responded loyally to every call for assistance.

The report had much to say about the railroads and their operation. It drew attention to the fact that while federal control of railroads, which excludes local regulation, may perhaps be tolerable in war times, it is neither expedient nor wise in time of peace. In the opinion of the committee it is desirable in the public interest that the state commissions should possess under federal control substantially the same authority over service and rates and the same general powers of supervision and investigation which they have exercised under private ownership. The situation with reference to the express companies and the telephone and telegraph companies was treated in a similar manner.

As to the electric utilities, the committee stated that the war has demonstrated the need not only for better utilization of existing power plants by the construction of tie lines and similar means, but also that for the further development of water-power sites. Several commissions have made extensive investigations with a view to bringing about greater economy and efficiency of power production. The subject has also been taken up on broad lines by Congress, and it was urged that state commissions continue to give it attention.

The report of the committee on public ownership and operation was presented by P. J. Lucey of the Illinois commission. No recommendations were made, except for a continued study of the question, as the committee deemed it unwise, in view of the war situation as affecting governmental operation of railroads, to formulate any definite conclusions on the subject.

Reports were also made by C. C. McChord of the Interstate Commerce Commission on safety of operation of railroad companies, by R. T. Higgins of Connecticut on safety of operation of public utility companies, by H. H. Williams of New Mexico on railroad service accommodations and claims, and by O. B. P. Jacobson of Minnesota on car service and demurrage.

On Wednesday the association adopted resolutions declaring against the adoption of new schedules of mileage scales of standard class freight rates as proposed by the Director-General of Railroads until times become normal again; also declaring that any further increase of net income to express companies should be secured by a reduction in the percentage of express charges now paid to railroad companies for the transportation of express matter and declaring in favor of an immediate investigation of the cost of such transportation to the railroad companies. The report of the committee on railroad rates was presented by D. N. Lewis of Iowa.

Dr. E. B. Rosa of the Bureau of Standards delivered an address on the work of that bureau and its relation to the work of the state commissions.

Royal G. Dunn of Florida, chairman of the committee on express and other contract carriers by rail, presented the majority report of that committee, which favored the abolition of express companies and the performance of the express functions by the railroad companies. Thomas Yapp of Minnesota presented a minority report containing some arguments against the plan advocated by the majority but urging further investigation of the subject. The convention refused to go on record as favoring the majority report, and after some discussion voted that it be received and printed.

Frederick J. MacLeod of Massachusetts presented the report of the committee on publication of the commission's decisions. The convention adopted the resolution presented by this committee urging the state commissions to assist the publishers of the decisions of the various state commissions in continuing and making permanent such publication.

Judge C. A. Prouty, director of public service and accounting of the United States Railroad Administration, addressed the convention on Wednesday afternoon. Judge Prouty appeared at the request of Director-General W. G. McAdoo, but did not voice the views of the Director-General, only his own personal views. He spoke upon the conditions growing out of the war as regards the transportation lines and also upon valuation.

At the conclusion of his address Judge Prouty was asked several questions by commissioners from the different states in regard to the division of jurisdiction between the United States Railroad Administration and the several state commissions. He declared that the Director-General was anxious for the coöperation of the state commissions and desired to coöperate with them. He advised the state commissions, before making orders affecting railroads under government control, to submit to the Director-General the proposed order.

A. S. Burleson, Postmaster General, spoke on Thursday concerning the telephone and telegraph situation.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

A. I. E. E., Utah Section.—At the meeting of the Utah Section of the A. I. E. E. held Sept. 26 Prof. Orin Tugman of the University of Utah spoke on "Modern Theories of the Constitution of Matter."

Electric Club of Philadelphia.—At a meeting of the Electric Club of Philadelphia held Nov. 7 George L. Thompson of the General Electric Company addressed the members on "Why I Entered and Why I Remained a Member of the Electrical Industry."

I. E. S., New York Section.—Last Thursday evening, Nov. 14, the New York Section of the Illuminating Engineering Society held a meeting for the discussion of the topic "The 1917-1918 Report of the Committee on Automobile Headlight Specifications."

Engineers' Club of Philadelphia.—At its regular meeting of Nov. 19 the Engineers' Club of Philadelphia will be addressed by George W. Braden, former Y. M. C. A. director of athletics and recreation for the Italian army, the subject being "Overseas Experiences in Italy."

A. I. and S. E. S., Pittsburgh Section.—On Nov. 23 the Pittsburgh Section of the Association of Iron and Steel Electrical Engineers will hold an important meeting, at which J. E. Fries, electrical engineer Tennessee Coal, Iron & Railroad Company, will read a paper on "Sixty-Cycle Versus Twenty-five Cycle Power for Steel Mills."

A. S. C. E.-A. S. M. E.—Conservation of steel will be discussed at a joint meeting of the American Society of Mechanical Engineers and the American Society of Civil Engineers to be held in New York on Nov. 20. The present urgent demand for iron and steel and feasible methods of conserving the available supply will be considered.

A. I. E. E., Portland Section.—Two illustrated addresses were delivered before the Portland Section of the A. I. E. E. on Oct. 8, 1918. W. L. Finley, State biologist, described "Bird, Animal and Outdoor Life in Oregon." "Production of Spruce for Airplane Stock" was the title of the address by Major William A. Walsh, division engineer spruce production division.

Railway Electric Engineers.—The tenth annual convention of the Association of Railway Electrical Engineers at the Hotel La Salle, Chicago, Oct. 29 to 31, was especially well attended. The program included committee reports on data and information concerning illumination, electrical equipment and practice for ore and coal docks, electric head lamps, train-lighting equipment and practice, shop practice, electric welding, conservation of equipment and methods for increasing efficiency, layout for engine terminals, shop yards and classification yard lighting, the care and maintenance of railway stationary power plants and electrical organization. The following officers were elected for the ensuing year: President, J. E. Gardner, Chicago, Burlington & Quincy Railroad; secretary-treasurer, Joseph A. Andreucetti, Chicago & Northwestern Railroad.

A. I. E. E., Ithaca Section.—The regular monthly meeting of the Ithaca Section of the A. I. E. E. was held Sept. 20 at Franklin Hall, Cornell University. The program was built around a symposium on "Electricity in the Navy" as follows: (1) "Steering and Range Finding," by R. G. Skinner; (2) "Propulsion of War Vessels," by T. J. Ryan; (3) "Wireless Equipment," by G. R. Rebman, Jr., and F. W. McDonnell; (4) "Searchlights," by G. Rees.

Annual Meeting, A. S. M. E.—The annual meeting of the American Society of Mechanical Engineers is planned for New York City on Dec. 3 to 6 inclusive. Tentative plans for the session of Dec. 4, which will be devoted to the general topic "Human Engineering," include the following papers: "Organization," "Standardization and Administration of Wages," "Non-Financial Incentives," "Incentive of Control in Industry," "Intensive Training" and "Human Relations in Industry." One session will be under the auspices of the gas power sub-committee, with papers on oil engines and cooling losses in combustion engines. Another session will be a joint session with the American Society of Refrigerating Engineers, which holds its annual convention simultaneously with the A. S. M. E.

Franklin Institute.—A program of lectures for the year 1918-1919 was lately announced by the Franklin Institute of Philadelphia which included the following: Nov. 7, "The Power Company," by William C. L. Eglin, a historical résumé in a semi-technical form showing graphically the development of the electric lighting and power industry; Jan. 9, 1919, "The Induction Electrical Furnace, with Special Reference to the Use of Induced Currents of High Frequency," by Guilliam H. Clamer, a history of the development of the induction furnace, describing the fluid motions in induction furnaces, the practical application of the vertical-ring induction furnace and practical application of induction furnaces using high-frequency currents; Feb. 6, "Industrial Lighting," by C. E. Clewell, dealing with the physical aspects of modern industrial lighting and emphasizing the outstanding features of good lighting. Reference will be made to existing codes of factory lighting, to the apparent needs in the state inspection departments if such codes are to be administered effectively and to some problems in industrial lighting added by the war.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

New Rates for California Company.—The Mountain Light & Water Company, which serves electricity in Brookdale, by a decision of the California Railroad Commission is permitted to charge new rates. Under the new schedule minimum annual payment is increased to $15 for electricity for residence and household use. Commercial lighting is fixed at 10 cents a kilowatt-hour, with a minimum of $50 a year for hotels and boarding houses of twenty-five rooms or over and $20 for under twenty-five rooms but over ten rooms. Commercial business places are charged $15 a year. There is also a flat rate of $10 a year for small cottages, optional with the public service company.

Metered Service Ordered for Small Pacific Coast Company.—The California Railroad Commission has authorized the Vacaville Water & Light Company to discontinue its flat-rate service for electricity and to put all consumers upon a metered schedule, effective on Nov. 5. The maximum lighting rate is 9 cents a kilowatt-hour. The minimum charge is $1 a meter a month. The maximum heating and cooking rate for the first 100 kw.-hr. a month is 4 cents a kilowatt-hour, with a minimum charge of $2.50 a meter a month. The general power rate is 4 cents a kilowatt-hour for the first 300 kw.-hr., graduating down to 2 cents a kilowatt-hour for all over 2500 kw.-hr. a month, with a minimum charge of $1 a month for each horsepower of connected load, and there is also an agricultural power rate fixed, with a minimum charge of $6 a year for each horsepower of connected load. The Vacaville company supplies electricity in and around Vacaville, Solano County, to about 500 consumers, 100 of them being charged flat rates, and purchases its entire supply of electric energy at wholesale from the Pacific Gas & Electric Company. The company's contract with the latter company has expired, and as the commission fixed higher rates for the Pacific company some time ago, the Vacaville company will pay increased rates for its electricity. The rates fixed will increase the Vacaville company's electric revenue $900 a year and will provide it with a net revenue of $3,040 a year, which is 8.90 per cent on the average capital for the current year for depreciation and return. The depreciation in electic properties such as the Vacaville company's amounts to 3 per cent a year, so that the actual return from the rates fixed is less than 6 per cent on the value of the company's electric properties.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Commission Orders Interconnection.—The Illinois Public Utilities Commission has issued an order directing the Central Illinois Light Company and the Canton (Ill.) Gas & Electric Company to erect and install such new construction as may be necessary to connect the 13,000-volt, two-phase circuits of the two companies within forty-five days.

Cleveland Municipal Plant Operations.—According to Light Commissioner Davis, the municipal plant at Cleveland, Ohio, will lose money if it is forced to pay taxes. If not, it will break about even. However, when the new addition to the plant is completed there will be a heavy loss unless money can be obtained with which to extend the lines. In 1915 the plant had 14,100 consumers, and this number had been increased to 21,000 up to this year.

Fuel Administration Suggests Interconnection.—The state fuel administrator of Illinois has addressed a letter to the Mayor of the city of Springfield, calling his attention to the fact that quite a saving could be made in fuel if the lines of the municipal plant were connected with the lines of the Springfield Gas & Electric Company. The Mayor has directed that a mass meeting be called to consider the matter. The fuel administrator will be represented.

Fuel-Oil Conservation Meeting.—About 300 representatives from fuel-oil and coal-burning plants in the Illinois district assembled recently at the request of Nelson G. Phelps, district engineer, Bureau of Oil Conservation. The object of the meeting was to arouse enthusiasm in the conservation of oil, to point out wasteful practice and to indicate where improvements might be made. Officials from the Fuel Administration at Washington were present to assist the local organization.

Pacific Gas & Electric Financing.—The California commission has authorized the Pacific Gas & Electric Company to issue $5,000,000 of its 5 per cent general and refunding mortgage bonds, or $5,000,000 of its 6 per cent first preferred stock, or portions of each aggregating $5,000,000, the bonds to be sold at 85 and the stock to be sold at not less than $82.50. The proceeds are to be used by the company to reimburse its treasury for capital expenditures made before May 31 last and to finance future construction work. The company showed that it has made capital expenditures of $3,504,255.57 against which no stocks or bonds have been issued, and it estimates new construction involving expenditures of $5,785,164, a total of $9,289,419.

Higher Electric Rates Authorized in Mobile.—The Alabama Utilities Commission has authorized the Mobile Electric Company to increase rates for electric light and power.

Rate Increase of Oklahoma Company.—Substantial increases in electric light and power rates charged by the Oklahoma Gas & Electric Company in Oklahoma City, Muskogee, Enid, El Reno, Drumright and other cities have been authorized by the Corporation Commission of Oklahoma. The new rates apply to the bills for service rendered on and after Nov. 1.

American Firm Applies for Use of Eight Enemy Patents.—The Draeger Oxygen Apparatus Company, Wilkinsburg, Pa., has applied to the Federal Trade Commission for license to use eight patents for respiratory, resuscitating and breathing apparatus devices and the trade mark "Pulmotor," which it claims is enemy-owned or controlled. The patents were issued originally to Johann Heinrich Dräger of Lubeck, Germany, and to other assigners to the firm of Drägerwerk Heinrich & Bernhard Dräger of Lubeck, Germany. The commission is considering the merits of the application.

New Work for Central-Station Institute.—The accounting section of the National Electric Light Association has, through the Central Station Institute of Chicago, established an elementary bookkeeping and accounting course for preliminary training and a highly specialized advance course, both of which are open to all employees of central-station companies who recognize this need and have an eye for the future. Both of these courses have been made available to the day worker by correspondence. The elementary course consists of seven lessons, beginning with the fundamentals of bookkeeping, going on through its ramifications as applied to a mercantile business and, at the finish, giving the student a glimpse at the enormous possibilities of the subject. This elementary course supplies the fundamental knowledge of accounting. It should prove not only attractive to the student who expects to make it his life work but to the one who wishes a firm foundation for other lines of effort. The advanced course consists of thirty-six lessons, mailed to the student as desired during two school years of nine months each. The student begins a special study of electric utility accounting, especially prepared by an expert and carefully edited by a committee made up of authorities on utility business. When he has finished he knows all there is to know of the subject. Then, too, the certificate he gets when he completes the course helps to remind him of the fact. These courses were prepared and written by a certified public accountant. Communications should be addressed to Fred R. Jenkins, Central Station Institute, Room 1647, Edison Building, Chicago.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

Meter Charges Under Franchise Provisions.—Where a gas franchise was voted by people of a village and accepted by grantee, relation of parties was one of contract as to rates, etc., according to the Supreme Court of Michigan (168 N. W. 968). Under a village franchise to install and operate a gas plant, declaring that rates should not exceed a certain rate and authorizing removal of meter if no gas was used, unless 75 cents per month minimum charge was paid, company could only require of a customer retaining his meter either 75 cents a month in case no gas was used or payment for the amount of gas used per month, although such sum might be less than 75 cents.

Rights of Lineman Injured Through Negligence of Fellow Employee.—A duty rests upon a street-railway company to furnish its linemen with a reasonably safe place to work, and if, in accordance with its rules and the red-tag system of cutting out high-tension circuits, the foreman or other person delegated with authority to direct when the current should be on or off ordered the current on at some place where induced current might endanger the linemen, it could be found that the company had failed to perform its duty, the Supreme Court of Massachusetts held (120 N. E. 361). If high-tension wires of a street-railway company became alive by reason of the negligence of an operator, or some other person acting without authority, who was negligent in violating the company's rules, injury to a lineman resulted from the negligence of a fellow servant, a risk which the lineman assumed. If plaintiff employee was injured by the negligence of a fellow employee, he cannot recover under a count of his declaration alleging defective appliances. The burden was on the lineman suing the company for injuries to show that the pole and line on which he was working when the injury occurred became unsafe by the company's negligence. To recover the lineman must show that the cause which produced the injuries was one for which the company was liable. An experienced lineman was not entitled to a warning from the company against the negligence of a fellow employee in turning on current. If the company had knowledge that a current would be induced into telephone wires by turning power in high-tension wires at another point, the company was under personal duty to warn its lineman—a duty which could not be delegated to its superintendent.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

W. Jocelyn E. Dale has been relieved as chief engineer of power installations for the Matahambre Copper Mines and has been appointed superintendent of power with offices at Puerto de Santa Lucia, Pinar del Rio, Cuba, for the same firm.

H. E. Cox, formerly engineer for the Birmingham Railway, Light & Power Company, has become electrical engineer for the Birmingham Steel Corporation and not the Birmingham Steel Company, as was erroneously stated in the ELECTRICAL WORLD for Nov. 2.

Leavitt L. Edgar, superintendent of the field statistics department of the Edison Electric Illuminating Company of Boston, Mass., has been commissioned first lieutenant in the Quartermaster's Department, U. S. A. Lieutenant Edgar is now at Covington, Ky., supervising the construction of a 66,000-volt transmission line from the system of the Cincinnati Gas & Electric Company to a nitrate plant about 18 miles from the Ohio city. He is a son of Charles L. Edgar, president of the Boston company.

E. P. Peck has resigned as superintendent of operation, tests and repairs of the Georgia Railway & Power Company to become associated with the Bureau of Standards, Washington, D. C. Mr. Peck is particularly well known in the electrical engineering branch of the industry as an originator of test methods. He was born Aug. 13, 1882, at Atlanta, Ga., where he received his early education and in 1903 was graduated from the Georgia School of Technology. For two years he was engaged in electrical construction, maintenance and repair work and in August, 1905, started with the Georgia Railway & Electric Company in the repair shops. The following year he was transferred to the meter department, shortly afterward becoming foreman of that department, where he remained for two years, when he became assistant electrical engineer and foreman of the testing department. In the summer of 1915 he became superintendent of tests and repairs and two years later superintendent of operation in addition, which position he held until his resignation. Mr. Peck developed high-voltage frequency apparatus for insulator and other tests, standardized insulator tests, and was a pioneer in the development of a satisfactory lightning arrester for use on high-voltage telephone lines, besides developing an arrester for current transformer protection. He has developed a number of pieces of radio equipment, made detail studies of protective relay systems and prepared a series of curves for simplifying transmission-line calculations. He designed and built the company's new standardizing laboratory, testing laboratory, meter shop and laboratory, one of the best groups of central-station laboratories in the country. In addition to this he has done considerable development work in standardizing station operation. He has been a frequent contributor to the electrical press and has done much important work on engineering committees. For one year he served on the protective apparatus committee of the American Institute of Electrical Engineers, and for two years he was a member of the meter committee of the National Electric Light Association.

Cyrus A. Whipple has been appointed power-plant foreman of the United States Navy Yard on Puget Sound, at Bremerton, Wash., with charge of all electrical, hydraulic, air and other power utilized at the navy yard and auxiliary stations Mr. Whipple is a graduate of the University of Washington, 1899, and Cornell University, 1903, and has been engaged in engineering work on the Pacific Coast since 1903. He was one of the engineers on the construction of the Electron plant of the Puget Sound Traction, Light & Power Company, after which he worked out the consolidation of the navy yard power system which he is now operating. He was next engaged in building the Fraser Valley electric interurban system extending from Vancouver to Chilliwack, British Columbia. On completion of this he was superintendent of operation for the Mount Hood Railway, Light & Power Company of Portland, Ore., until it was sold to the Portland Light and Power Company, when he opened a private office in Portland. When the Southern Pacific company started electrification of its Willamette Valley system Mr. Whipple entered its service as chief assistant to the electrical engineer, which work he followed until construction was nearly completed. He was then appointed superintendent of light and water for the city of Eugene, Ore. He later became electrical and mechanical engineer for the Public Service Commission of Washington, in which capacity he was engaged in appraisal of all the large companies of the state. At the beginning of the war he entered work of the navy yard in connection with the large developments along shipbuilding lines at the yard, and he was recently appointed to take charge of the systems of power, telephones, water, etc., there.

Obituary

Ira H. Metzger was killed in the Brooklyn Rapid Transit catastrophe on the evening of Nov. 1. Mr. Metzger was twenty-nine years old at the time of his death and had already established a reputation as an able writer of technical advertising copy. For the last two years he had been in charge of the copy department of Rickard & Sloan, Inc., New York, and prior to that he was associated with the service department of *Industrial Management* and the *Electric Railway Journal*.

Charles O. Patterson, one of the pioneers in the electric lighting industry, died on Oct. 25 at East Newport, Me., at the age of fifty-nine years. In 1884 he took charge of the electric light plant at Jacksonville, Fla. In 1896, when the city of Jacksonville built a municipal plant, one of the first in the country, he was retained as superintendent and constructing engineer. He remained as superintendent for eight years, when he went into the electrical construction business.

Norman I. Moultrop of the electrical engineering department of the Boston (Mass.) Edison company, and only son of Irving E. Moultrop, assistant superintendent of the construction bureau of that organization, died recently of influenza at the United States Army General Hospital No. 1, Williamsbridge, N. Y. Mr. Moultrop was only twenty-nine years of age and would have received a commission as lieutenant in the Radio Air Service had be survived a few days longer. He enlisted in the aero service of the Signal Corps in December, 1917, with quarters at Fort Slocum. He was soon attached to a construction squad at Langley Field, Va., and was appointed first sergeant and placed in charge of all electrical work. The excellence of his work led to his recommendation by his commanding officer for transfer to the Air Service Radio School at Columbia University, New York, where he successfully completed the course and was awaiting orders to take up active duty when he was stricken. Widespread sympathy will be felt for Mr. Moultrop, Sr., as his loss becomes known.

Capt. Albert R. Thompson, formerly engineer of electric distribution for the San Francisco district of the Pacific Gas & Electric Company, met his death in France through an automobile accident that occurred on Sept. 17. Captain Thompson was born forty-one years ago in Rehoboth, Del., and upon graduation from New York University studied law and was later admitted to the New York State bar. Upon finding that the practice of law was not to his liking, he took up electrical engineering and entered the services of the New York Edison Company, from which he resigned in 1910 to go to California as engineer of electric distribution for the San Francisco district of the Pacific Gas & Electric Company. On Jan. 1, 1918, he entered the army and went to the Reserve Officers' Training Camp at Camp Lee, Va., where he was commissioned a captain. He was sent to Camp Devens, Mass., to serve with the Twenty-ninth Engineers and from there sailed for France on July 1. He was very much interested in employee organizations. He was the first chairman of the "Pacific Service" section of the National Electric Light Association, and when with the New York Edison Company he was president of the company's employee association.

TRADE & MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies— Notes on Industrial Activities and Business Methods

AFTER-WAR RESPONSIBILITY OF MANUFACTURER'S CREDIT MAN

Must Be Careful in Granting Credit to Jobbers with No Reserve to Absorb Losses Through Decline in Values

A greater responsibility will rest on the shoulders of the credit man in the months to come perhaps than ever before. That prices are going to come down must be admitted. That stocks purchased at high prices must not be carried at higher than the market is evident. That these stocks cannot be sold at more than the prevailing market price is certain. In other words, certain losses must be accepted just as certain unearned profits were taken on the advancing market.

Leading members of the electrical jobbing industry urged their fellow jobbers to lay aside from their unearned profits a reserve fund to be used in absorbing the losses that are bound to come when the tide of prices turns. Some of the prudent ones have naturally followed this course. It is not known to what extent this has been done, but there are no reasons for suspecting that those who have not set up a reserve are few in number.

The manufacturer's credit man, therefore, must look into this situation and find out to what extent his customers have taken steps to protect themselves. To those who have not so done the credit man must be very careful in granting credit and demanding collections. The credit man more than ever must be a student of conditions. He must be able to gage fairly closely the trend that prices are to follow so long as the market tends downward, not only as regards the goods of his own concern but also those of other concerns from which his customers purchase. This must be done in order that credit may be granted only to the extent that the customer will have to take the minimum loss. In fact, if the credit man is reasonably well posted and acts judiciously, he may by insisting on smaller stocks and therefore more rapid turnover turn the jobber's probable loss into a profit.

The manufacturer cannot leave the jobber to work out his own salvation. The manufacturer has an asset in the jobber that he cannot afford to lose—not only the immediate asset of bills payable, but also the asset of a well-founded distributer of goods. If jobbers for want of intelligent assistance from manufacturers are allowed, merely because they have not prudently laid by a reserve, to go under, the industry will not only lose from uncollectible accounts but also will be handicapped by having to create new distributers.

TRADE RESTRICTIONS ARE BEING LIFTED GRADUALLY

Greater Production of Appliances Allowed—Market Bare and Demand Undiminished—Modification of Building Restrictions Helpful

By Wednesday of this week supply conditions in the electrical field began to clear perceptibly. The trade has been anxiously awaiting some word from Washington as to how long before limitations would be removed from production.

It is now apparent that all of the restrictions will not be removed at once but gradually. Industry in this way will be able to get on a peace basis with less trouble than if all restrictions were removed immediately. Thus electric heating appliances, washing machines, sewing machines, vacuum cleaners and fans have their curtailments reduced by one-half. In other words, if the output of one of these has been curtailed 40 per cent, it can now manufacture up to 80 per cent of what it produced during the year of 1917.

With the stocks of the country practically swept bare of the above-mentioned materials, except perhaps fans, the new ruling will be welcomed by both producers and distributers. Of fans there is probably a better stock than was anticipated at the end of the fan season. So many orders were delayed and deliveries were so long that in not a few instances fans reached distributers and local warehouses too late to figure in the current year's sales. Moreover, the demand for the smaller sizes of fans was not so brisk as had been expected. Most of the demand had been in the larger size oscillators.

No halt is noticed in the consumer demand for appliances, and greater production will be necessary if this demand is to be filled even without stimulating sales. So great has this demand been that in many places distributers were allowed shipments of only a limited part of what they had ordered.

Another ruling from Washington that is of considerable interest to the trade is the modification of the new building restrictions reported elsewhere in this issue. This opens the possibility of trading in the old channels and of increased business by the electrical contractors. This character of work has fallen off to a minimum, although formerly it was considered to be the foundation load work of the trade in every place.

LARGE PRODUCTION AFTER WAR IS CONFIDENTLY ANTICIPATED

Output in Volume, However, Not Likely to Be Maintained Unless Buying Is Stimulated by Lower Prices

Speculation concerning the effect of peace on business is widespread. Will business be stimulated once the war restrictions are removed, or will buyers, feeling that prices will decline, hesitate to place orders? This and the question of what course prices will pursue are being given no small place in the thoughts of business men in every section of the country. The war presented many aspects of unknown character, but the period of reconstruction seems more baffling at present than the war period.

Many men of prominence in the business world have in the past few days expressed opinions on these questions, and there seems to be a unanimity of belief. That trade will fall off immediately upon the declaration of peace is pretty well held. Buyers will not have had time to adjust themselves to new conditions, and some time will be necessary for them to decide to enter the market. This condition, however, is everywhere expected to be but temporary, lasting anywhere from one to six months, the time to depend largely on the ability of the individual manufacturer to adjust his plant to the fabrication of products for commercial use. As soon as this temporary depression is over business is expected to leap again to peak levels and to continue so for some time.

The dearth of new building is pointed out as one reason for expecting business expansion. The building program

alone, if reports can be believed, would be almost sufficient to keep things going at top speed for many months. Besides there is the rehabilitation of steam railroads, for which huge quantities of supplies and labor will be required, probably very soon.

If these prognostications then are true, it is doubtful if any sharp break in prices will come. Of course, in any event there may be timid ones here and there who will liquidate their stocks a trifle under the market, fearing that prices may tumble.

While it is undoubtedly true that there is a large amount of new construction awaiting the placing of contracts, manufacturers and jobbers, in making any preparations in anticipation, must not lose sight of the fact that the ability to finance such work at prices which will not be prohibitive in the years to come has always been a considerable factor in the past.

There is no doubt anywhere that prices will eventually be considerably lower than they are to-day—perhaps not so low as they were in 1914, but still sufficiently lower than they are now to make the difference appreciable. Granting the truth of this general impression, then, it is highly doubtful if all of the projected new construction, and particularly that pertaining to light and power utilities, to telephone systems and to street railway companies, will be considered at prevailing prices and cost of financing after being deferred by these very things for so long a time.

In other words, it hardly seems likely that production will be stimulated over a long period after the war at prices that now exist. A rapid drop in prices would only serve to scare away business and, if general, bring about a panic. It does seem logical, however, to expect a gradual lowering of all prices according to generally recognized laws of economics. While there is undoubtedly sufficient unplaced business to keep production going at top speed for a long time, still events of the last few years indicate that factories will have to stimulate production by making lower prices.

METAL MARKET CONDITIONS

Everything Quiet Following Armistice Signing; Buyers Awaiting Developments

Immediately following the news of the signing of the armistice on Monday, absolute quiet prevailed in the metal market. Buyers with government contracts have decided to wait a little to see what news will come out of Washington.

That there are large stocks in the hands of manufacturers for fabrication into government orders is well understood. There seems to be some indication that some of these stocks may find their way to the market.

NEW YORK METAL MARKET PRICES

	Nov. 4	Nov. 12
Copper:	£ s d	£ s d
London, standard spot	122 0 0	122 0 0
	Cents per Pound	Cents per Pound
Prime Lake	Govt. price 26.00	Govt. price 26.00
Electrolytic	Govt. price 26.00	Govt. price 26.00
Casting	Govt. price 26.00	Govt. price 26.00
Wire base	28.75	28.75
Lead, trust price	8.05	8.05
Antimony	10.50	9.25
Nickel, ingot	40.00	40.00
Sheet zinc, f.o.b. smelter	15.00	15.00
Spelter, spot	9.00	8.75
Tin, Chinese *	No quotations	No quotations
Aluminum, 98 to 99 per cent	Govt. price 33.10	Govt. price 33.10

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	22.75 to 23.25	22.50 to 23.00
Brass, heavy	13.00 to 13.50	12.00 to 12.50
Brass, light	11.00 to 11.25	10.50 to 11.00
Lead, heavy	7.50 to 7.75	7.25 to 7.50
Zinc, old scrap	6.25 to 6.50	6.00 to 6.25

*No Straits offering.

THE WEEK
IN TRADE

HOSTILITIES are over and reconstruction is now uppermost. This is the greatest news of the week. The sales of the week will undoubtedly show a falling off. Monday was a holiday, and since then many contracts have been canceled and the buying has shown some falling off—not everywhere but sufficiently to show that buyers are not altogether inclined to place contracts when things are so uncertain.

The government has announced that it is not disposed to cancel its contracts with producers so long as there remains a supply of raw materials accumulated for the carrying out of those contracts. Restrictions on the production of electrical appliances are being removed gradually, and better shipments can be expected soon.

Labor is beginning to drift away from munitions plants back to those plants which are expected to be strong in the reconstruction period.

Prices are remaining very steady, and there are no indications at the present time of any immediate change. In fact, in a few lines there were advances announced this week.

NEW YORK

Monday's good news stopped everything in the way of business. New York went wild with joy, and the people thronged the streets from early morning until late at night rejoicing. Some attempts were made to carry on business in the morning, but nowhere did they meet with any success.

Since then business has been good, bad and indifferent. Some houses report an unusually large amount of new business, largely government orders, and others report things as being very quiet. Some orders have been canceled as a result of the news, but this condition is met with only here and there.

The removal of restrictions on new building under $10,000 private and $25,000 industrial was expected on Thursday. No anticipatory orders, however, were reported early in the week.

Stocks are low, but the easing up on allocation of raw materials by the War Industries Board is expected to help this condition shortly.

Labor is beginning to drift back from purely war plants to commercial manufacturing plants, and in this movement electrical plants will undoubtedly benefit.

WIRE.—Manufacturers are continuing to produce and ship in undiminished quantities the outpost wire ordered by the government. Manufacturers at this writing expect to continue on this order until it is completed, which will be some months from now. The wire, which is No. 19 B. & S. two-conductor twisted, while ordered for field telephone and signal purposes, can be used to a great extent in reconstruction and in the policing of central Europe that will have to be done by the Allies. If this order is to be fully completed, there will continue to be a shortage of small-size wire. In some places stocks are virtually negligible. It might be noted that the insulated wire contract with the government contains a sixty-day notice cancellation clause.

LAMPS.—A quicker movement is noticeable. Stocks are good. One large concern has increased its warehouse space to take care of the anticipated big demands. Withdrawal of lightless night orders is expected, and with it the lamp market should be further accelerated.

INSULATORS.—High-tension insulators are in good demand, and the supplies on hand, according to one of the

larger manufacturers, are ample. Low-voltage types are in fair supply.

MOTORS.—The largest distributers in the local market state that they have felt no reduction in the volume of orders as a result of the end of hostilities. Supplies are limited.

APPLIANCES.—One of the largest producers advanced prices this week from 10 to 20 per cent. Another producer, anticipating such action perhaps, began this week to notify customers that all orders are taken subject to prices as of date of shipment. There has been no increase in the Marsh patent schedule, however, since that which went into effect on Aug. 10.

CONDUIT.—Some jobbers are finding a little freer movement in incoming stock, but on the whole the situation is unchanged. So far as could be learned, no stock replenishment shipments for general purposes are yet being made.

MOTOR-GENERATOR SETS.—The Emerson Electric Manufacturing Company is reducing about one-third the prices of small motor-generator sets used for battery charging owing to the accumulation of an overstock.

CHICAGO

The feature of last week has been the half day's holiday occasioned by the rumor of an armistice on Thursday. Practically no business was done in the city during that afternoon owing to the fact that the workers left their places at noon and, joining the celebration, failed to return. Jobbers report that the rumor had a temporary effect on a few large contracts but that nothing serious has resulted, since the buyers placed the orders on the succeeding day when it was learned that the rumor was not confirmed. The celebration has had the effect, however, of stimulating some intensive thinking in regard to the future. Well-informed sources seem to believe that the latter half of 1919 will see a considerable amount of public utility financing in the Middle West.

There have been no price changes. News of war construction still continues to abound. The War Department has authorized the construction division to proceed with a new cantonment at Fort Benjamin Harrison, Ind., to cost $2,632,257, and five vehicle storage buildings at the Rock Island Arsenal, to cost over $500,000.

The general volume of business continues satisfactory. More attention is being paid to export trade. The expected wave of railroad buying under government control has not materialized, the roads continuing to buy from hand to mouth as they have heretofore.

INDUSTRIAL LIGHTING.—Business is especially good at this season of the year and has been stimulated somewhat by the shift in the clock.

COPPER WIRE.—Trouble appears to be ahead for the jobbers in securing the smaller sizes of wire. Now that the factories which are taking up government work have secured the copper on which to go ahead with these orders, they are notifying their domestic customers that it will probably be three or four months before they can do anything for them.

CONDUIT.—The situation is improving somewhat, one factory recently notifying its Chicago distributers that it will begin to ship on B-1 and B-2 priorities where it has heretofore been shipping only in Class A.

ELECTRIC RANGES.—Some of the manufacturers see an opportunity to advertise to central stations that stand to lose temporarily some of the industrial load created by the war.

CABLE.—The Commonwealth Edison Company is again in a position where it must buy cable for its immediate needs. Until recent months it has been able to get along with the cable on hand and contracted for.

FARM-LIGHTING PLANTS. — The Farm Power and Light Manufacturers' Association has collected data which it is now ready to submit to the War Industries Board at Washington to secure its classification as to priorities.

CEDAR POLES.—The market for cedar poles is improving.

EXPORT ELECTRICAL APPLIANCES.—The export branch of the electrical appliance business is engaging the attention of many Middle Western manufacturers. This is true even with some of the smaller concerns. It is the experience of these manufacturers that people in Italy, England, Norway, Holland and Australia are crying for electrical goods of American manufacture. They are ordering in large quantities and are sending cablegram after cablegram to New York banks arranging for payment of the shipments they desire.

HYDROELECTRIC APPARATUS.—Plans have been approved for the following dams in Wisconsin: Clintonville Power Company on the Embarrass River at Clintonville, West Bend Woolen Mills on the Milwaukee River at West Bend, Barton Rolling Mills on the Milwaukee River at Barton, Badger Rolling Mills on the Milwaukee River at Grafton, Peninsular Power Company on the Brule River near Florence, Lake Wingra Lock & Spillway on Lake Wingra, Madison. Applications for permits to build dams have been made by the Jackson Milling Company, Stevens Point; the Peninsular Power Company, Florence; the Clintonville Power Company; the Ironwood & Bessemer Railway & Light Company, Montreal River, and the Union Falls Manufacturing Company at Oconto Falls.

BOSTON

The victorious conclusion of hostilities Monday was celebrated by a two days' vacation in the electrical industry in New England. A new era has begun and trade conditions already forecast it. The volume of business has been decreasing materially of late from week to week, especially in industrial power equipment lines. The sale of appliances has been much below normal, though commensurate with the available supply. Some accumulation of stocks has been noted, especially in motors and lamps. About four weeks ago it became apparent that the end of the war could not be far off, and the realization of this was the signal for a decided curtailment in inquiries. Cancellation of many government contracts appears to be inevitable, and a readjustment period is believed to be upon the industry. The feeling is very widespread, however, that conditions are fundamentally sound and that the transition to a peace basis will be sufficiently gradual to enable most of the shocks to the trade to be absorbed without lasting injury.

With the passing of many government orders, of which New England holds an enormous total, markets long withheld are expected soon to be available. Building construction for non-war purposes has been at a standstill for about two years. The market for civilian goods clamors for relief through the production and distribution of an immense variety of staples, and with the coming of peace the opportunity for development work comes again to the front as a prime factor in trade expansion. Central stations must meet a long list of accumulated applications for service. A large amount of wiring and installation work must be done by the contractors as restrictions upon building are removed. The textile and shoe factories of New England must fill the demands of the citizen buyer as well as the requirements of our overseas guard forces. Shipbuilding, it is learned from reliable sources, will be pushed hard in this territory, and a considerable amount of betterment work impossible in the rush of war conditions is slated to be performed as soon as may be. Reconstruction work in the war zones appears certain to draw heavily upon the resources of electrical New England as conditions abroad become more and more settled.

At this writing prices have held firmly, although a tendency toward lower quotations in motor sales under close competition is to be seen. An early drop in prices is anticipated along many lines, now that hostilities have ceased. The retention of women in industry seems likely to be a factor in labor competition which will make for lower costs. The accumulation of stocks will also tend tow-

ard cuts in quotations. Some movement is to be seen just now in portable lamps, and the new Edison portable lamp is receiving favorable patronage. The demand for industrial electric trucks and other labor-saving equipment continues excellent, with deliveries varying more or less from week to week according to type. The retail market for electric radiators has not been exhausted, despite the shortage reported by jobbers. The lessening of the federal restrictions upon display lighting is leading to an increased consumption of moderate-powered units. Washing machines maintain their reputation as quick sellers and the demand for these will unquestionably be stimulated as raw materials are gradually released from purely war requirements. The demand for motor-driven coal-loading machinery is very active.

ATLANTA

The general volume of business is holding up well. This includes the total transacted for both government account and commercial lines. Manufacturers report that shipments on the whole are improving and that factory facilities are in better shape now than in a long time. Then, too, there are not in sight at this time the possibilities of such future large orders for equipment and material as existed a year ago.

The new ruling of the War Industries Board barring the construction of churches, schools, hotels, office buildings, apartment houses and twelve other types of buildings will further tend to curtail the demand for schedule material, flexible conduit and fixtures. Although the sale of schedule material and conduit for this class of construction was curtailed before this order went into effect, the volume of fixture business has been good considering the circumstances. This is owing to the fact that buildings that have been started were permitted to be completed, which maintained the demand for fixtures of all types. The Selden-Breck Construction Company, St. Louis, Mo., has been awarded the contract for Camp Benning, Columbus, Ga. Plans include 1200 buildings, 500 barracks, 45 storehouses and 14 warehouses. There are also to be an electric laundry, costing $250,000, and waterworks. Lockwood & Greene Company, Atlanta, Ga., are engineers.

CREDITS AND COLLECTIONS.—A survey of the field from the manufacturers' viewpoint indicates that immediate collections are fair but certainly not up to expectancy nor equal to percentages obtained in 1917. Further investigation reveals the fact that, while comparatively small accounts are being cleared up as anticipated, the great variation in percentage of available collections or accounts receivable is due to the large accounts with public utilities and industrials, which are somewhat behind. Collections prior to the fourth Liberty loan were classed as good, but present indications point to slowness. The collection of tax money by municipalities is reflected in their accounts, which are being cleared up very satisfactorily. A tighter rein is being held on this class of accounts by the manufacturers, however, as they expect tardiness again when tax funds have been distributed. During the summer and early fall months the manufacturers held a large amount of jobbers' and distributers' paper, owing to the placing of large stocks for the following six to eight months, but the amount of outstanding acceptances and other classes of paper show a decided decrease compared with the summer months, and collections from these sources may rightly be classed as of an excellent character.

RECTIFIERS.—Sales, especially of the resistance type, are breaking all records, and the only difficulty is delivery. Jobbers report a heavy and insistent demand that cannot be supplied. Shipments are now running from eight to ten weeks. There is no such thing as a stock any more, as most of the equipment is sold in transit. Prices remain steady under the pressure.

WIRING DEVICES.—Following the recent advance in price, a slowing up in this line has been noted. This is only a temporary lull, however.

SEATTLE—PORTLAND

Seattle jobbers and dealers report the volume of sales during last week more or less interrupted owing to the premature announcement of the signing of the armistice, and the continued closing order brought about by the influenza epidemic. Jobbers' sales to shipyards and industrials show little decrease. When the authorized announcement of the signing of the armistice on Monday came, Seattle and other Northwest cities took a full holiday.

The influenza situation is showing a steady improvement, and it is believed that the ban on public gatherings and full-length business days will be lifted by the end of the current week. Portland jobbers report that the changed hours for business due to influenza have been very disconcerting and that the shortening of business days and premature rumors of peace have had a tendency to hold up sales of considerable importance which were expected to materialize this week. However, electrical jobbers report business about the same as for the past several months.

Stocks apparently are in about the same shape. The usual shortage in steel exists. There is a temporary shortage in certain sizes of lamps, particularly the 100-watt and 150-watt type C "Mazdas." Jobbers and manufacturers report collections as good. Electrical contractors state that business is slightly better than usual, being affected very little by influenza or early closing and report collections on current bills to be in very good shape. However, they are experiencing considerable difficulty in making collections of old accounts. Notice has just been received of an advance of from 25 to 35 per cent on electrical utensils. Such a marked increase comes as somewhat of a surprise at this time, although some increase was naturally not unexpected. The conduit situation remains unchanged, with the demand heavier than supply.

Lamp replacements and renewals continue in heavy demand. Washing machines are still the leader in domestic appliance sales and are becoming increasingly difficult to secure. All other labor-saving devices are moving well and are fairly easy to obtain. The building campaign to construct homes for war workers is creating real demand for wiring devices and fixtures. The campaign is proceeding satisfactorily despite labor shortage and difficulty in securing materials and authority to proceed with work.

Motor sales to shipyards and industrials show no marked change, although the volume is well sustained. Several orders of considerable magnitude are pending, the most important being from the Portland territory. Deliveries have not shown any improvement and stocks are very low, shipments being absorbed as soon as received. Seattle and Tacoma report collections very good. No new credits of any importance were placed during the past week.

SAN FRANCISCO

Signs of industrial adjustment are evident. Unskilled labor is being eliminated from the shipyards and steel works, and all overtime work has ceased. The government, however, shows no diminution in its construction schedule. Six warehouses for the San Francisco Presidio and new barracks for Camp Kearney, to cost $2,000,000, are scheduled. Miscellaneous construction recorded includes a huge concrete storehouse near Sacramento for the Northern California Milk Producers' Association and a six-hundred-thousand-dollar cement plant for Porterville.

LAMP GUARDS.—"Hold-Fast" guards have advanced 10 per cent. A local agent reports that sales of his guards have doubled over last year and that a recent 100-gross order from the Northwest has set a new factory record. A very drastic test is now required by certain shipyards, namely, that crumpled guards must be capable of being rebent to their original shape with their protection powers unimpaired.

BOXES AND COVERS.—Galvanized boxes and covers have advanced 10 per cent. Pacific Coast jobbers no longer list the plain pieces, as they are banned by local and national regulations.

Current Prices of Electrical Supplies

New York and Chicago Quotations

THE prices quoted are those prevailing in standard packages of specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists of contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the sources of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers. Price variations may be due to difference in grade of products of different manufacturers, to local conditions, or to both.

ARMORED CONDUCTOR, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List per 1000 Ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE AND DISCOUNT PER 1000 FT.—NEW YORK

Single-Conductor

	No. 14 Solid
Less than coil	List
Coil to 1000 ft	6%–10%
	No. 12 Solid
Less than coil	List
Coil to 1000 ft	6%–10%

Twin-Conductor

	No. 14 Solid
Less than coil	List
Coil to 1000 ft	6%–10%
	No. 12 Solid
Less than coil	List
Coil to 1000 ft	6%–10%

DISCOUNT—CHICAGO

Single-Conductor

	No. 14 Solid
Less than coil	+30% to $73.20
Coil to 1000 ft	List
	No. 12 Solid
Less than coil	+30% to $85.20
Coil to 1000 ft	List

Twin-Conductor

	No. 14 Solid
Less than coil	$115.00
Coil to 1000 ft	100.00
	No. 12 Solid
Less than coil	+20% to $162.00
Coil to 1000 ft	List

ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each.
Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	+20%
1/5 to std. pkg	List
Std. pkg	15% to 17%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	+30% to 12%
1/5 to std. pkg	+5% to 20%
Std. pkg	18% to 44%

BATTERIES, DRY

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.45—$0.46	$0.45—$0.47
2 to 50	.40	.40— .41
50 to barrel	.35— .36	.36— .37
Barrel lots	.32— .329	.33— .339

BATTERIES, DRY—Continued

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.40 to $0.45	$0.40 to $0.45
12 to 50	.35 to .39	.35 to .39
50 to barrel	.319 to .362	.329 to .382
Barrel lots	.289 to .332	.299 to .342

CONDUIT, METALLIC FLEXIBLE

Size, In.	Ft. per Coil	List per 100 Ft.
⅜	250	$5.00
½	250	7.50
¾	100	10.00
1	50	13.00
1¼	50	21.00
1½	50	26.00
2	25–50	35.00
2½	25–50	45.00

NET PER 1000 FT.—NEW YORK

	Less than Coil	Coil to 1000 Ft.
⅜-in. single trip.	$75.00	$63.75— 69.75
½-in. double strip	75.00— 82.50	72.00— 75.00
½-in. single strip	100.00	85.00— 93.00
½-in. double strip	100.00—110.00	96.00—100.00

NET PER 1000 FT.—CHICAGO

	Less than Coil	Coil to 1000 Ft.
⅜-in. single strip	$75.00	$63.25 to $64.25
⅜-in. double strip	78.25 to $90.00	71.25 to 75.00
½-in. single strip	100.00	75.00 to 85.00
½-in. double strip	105.00 to 120.00	93.00 to 100.00

CONDUIT, NON-METALLIC FLEXIBLE

Size, In.	List per Foot	Size, In.	List per Foot
⅜	$0.05½	1	$0.25
½	.06	1¼	.33
¾	.09	1½	.40
¾	.12	1¾	.47
¾	.15	2	.55
¾	.18	2½	.65

NET PER 1000 FT.—NEW YORK

	Less than $15 List	$15 to $60 List	$60 to $150 List
⅜-in.—	$25.00–51.70	$24.00–35.20	$23.00–30.25
½-in.—	30.00–56.40	28.00–38.40	26.00–33.00

NET PER 1000 FT.—CHICAGO

	Less than $15 List	$15 to $60 List	$60 to $150 List
⅜-in.—	$44.00–60.00	$30.00–33.00	$26.50–29.15
½-in.—	48.00–65.00	33.50–36.00	29.00–31.80

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

Card No. 40

Size, In.	Conduit, List per Foot
⅛	$0.08½
¼	.08½
⅜	.08½
½	.11½
1	.17
1¼	.23
1½	.27½
2	.37½
2½	.58½
3	.76½

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON—Continued

Size, In.	Couplings, List	Elbows, List
⅛	$0.05	$0.19
¼	.06	.19
⅜	.07	.19
½	.10	.25
1	.13	.37
1¼	.17	.45
1½	.21	.50
2	.28	1.10
2½	.40	1.80
3	.60	4.80

DISCOUNT—NEW YORK

	⅛ in. to ½ in.	¾ in. to 3 in.
Less than 2500 lb.	7% to 7.1%	9% to 9.1%
2500 to 5000 lb.	10% to 10.1%	12% to 12.1%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

	⅛ to ½ In.	¾ to 3 In.
Less than 2500 lb.	+5.5% to 3.5%	+3.5% to +1.5%
2500 to 5000 lb.	+2.5% to +0.5%	+5% to 1.5%

(For galvanized deduct six points from above discounts.)

FLATIRONS

NEW YORK

List price	$6.00 to $7.00
Discount	20% to 30%

CHICAGO

List price	$6.00 to $7.00
Discount	20% to 30%

FUSES, INCLOSED

250-Volt	Std. Pkg.	List
3-amp. to 30-amp.	100	$0.25
35-amp. to 60-amp.	100	.35
65-amp. to 100-amp.	50	.90
110-amp. to 200-amp.	25	2.00
225-amp. to 400-amp.	25	3.60
450-amp. to 600-amp.	10	5.50
600-Volt		
3-amp. to 30-amp.	100	$0.40
35-amp. to 60-amp.	100	.60
65-amp. to 100-amp.	50	1.50
110-amp. to 200-amp.	25	2.50
225-amp. to 400-amp.	25	5.50
450-amp. to 600-amp.	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	30%
1/5 to std. pkg	41% to 45%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	30% to 31%
1/5 to std. pkg	40% to 41%

FUSE PLUGS

3-Amp. to 30-Amp.

NEW YORK

	Per 100 Net
Less than 1/5 std. pkg	$6.00 to $9.37
1/5 to std. pkg	5.25 to 7.00

Standard packages, 500. List, each, $0.07

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg	$8.00
1/5 to std. pkg	7.00

Standard packages, 500. List, each, $0.07

LAMPS, MAZDA OR TUNGSTEN

110 to 125 Volts

Regular, Clear:	Std. Pkg.	List, Each
10 to 40-watt—B	100	$0.35
60-watt—B	100	.40
100-watt—B	24	.85
75-watt—C	50	.70
100-watt—C	24	1.10
200-watt—C	24	2.20
300-watt—C	24	3.25
Round Bulbs, 3½-in., Frosted:		
15-watt—G 25	50	.60
25-watt—G 25	50	.60
40-watt—G 25	50	.60
Round Bulbs, 3½-in., Frosted:		
60-watt—G 30	24	.82
Round Bulbs, 4½-in., Frosted:		
100-watt—G 35	24	1.15

DISCOUNT—NEW YORK

Less than std. pkg	List
Std. pkg	10%

DISCOUNT—CHICAGO

Less than std. pkg	List
Std. pkg	10%

LAMP CORD

Cotton-Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
Less than coil (250 ft.)	$30.47—$40.77
Coil to 1000 ft	27.42— 30.22

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft.)	$38.00
Coil to 1000 ft	28.00

LAMP GUARDS, WIRE

Standard packages from 50 to 150

NEW YORK

Net per 100	$24.00

CHICAGO

Net per 100	$23.93 to $30.00

OUTLET BOXES

Nos.	List per 100
101—A, A 1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200, S.E., 300, A.X., 1½, 4 S.	30.00
103—C.A., 9, 4R, B 1½	25.00
106—F.A., 7, C.S., 1½, 3 R	20.00

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $10.00 list	26%	20%
$10.00 to $50.00 list	36%	31%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $10.00 list	20%	10%
$10.00 to $50.00 list	30%	20%

PIPE FITTINGS

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	10%
1/5 to std. pkg	20%
Std. pkg	30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	5%
1/5 to std. pkg	15%
Std. pkg	25%

PORCELAIN CLEATS—UNGLAZED

Two and Three Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. pkg	$21.00 to $34.00
1/5 to std. pkg	17.85 to 28.90

Standard package, 2200. List per 1000, $21 to $34

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg	$16.80–24.15
1/5 to std. pkg	15.80–21.00

Standard package, 2200. List per 1000, $20.00–21.00

PORCELAIN KNOBS

NEW YORK

Per 1000 Net.	Std. Pkg. 3500 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000 N.C.
Less than 1/5 std. pkg	$16.00 to $22.00	$32.00
1/5 to std. pkg	13.60 to 18.70	27.20

CHICAGO

Per 1000 Net.	Std. Pkg. 3500. 5½ N.C.—Solid Nail-it—N.C.	Std. Pkg. 4000 N.C.
Less than 1/5 std. pkg	$11.70–$18.40	$33.85–$36.80
1/5 to std. pkg	10.15– 16.00	26.60– 32.00

SOCKETS AND RECEPTACLES

	Std. Pkg.	List
½-in. cap key and push sockets	500	$0.33
½-in. cap keyless socket	500	.30
½-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	+20%
1/5 to std. pkg	List

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	List
1/5 std. pkg	10%

SWITCHES, KNIFE

250-Volt, Front Connections, No Fuse

High Grade:	
30-amp. S. P. S. T	$0.80
60-amp. S. P. S. T	1.20
100-amp. S. P. S. T	2.25
200-amp. S. P. S. T	3.48
300-amp. S. P. S. T	5.34
30-amp. D. P. S. T	1.20
60-amp. D. P. S. T	1.78
100-amp. D. P. S. T	3.38
200-amp. D. P. S. T	5.20
300-amp. D. P. S. T	8.00
30-amp. 3 P. S. T	1.80
60-amp. 3 P. S. T	2.68
100-amp. 3 P. S. T	5.08
200-amp. 3 P. S. T	7.80
300-amp. 3 P. S. T	12.00
Low Grade:	
30-amp. S. P. S. T	$0.42
60-amp. S. P. S. T	.74
100-amp. S. P. S. T	1.50
200-amp. S. P. S. T	2.70
30-amp. D. P. S. T	.68
60-amp. D. P. S. T	1.22
100-amp. D. P. S. T	2.50
200-amp. D. P. S. T	4.50
30-amp. 3 P. S. T	1.02
60-amp. 3 P. S. T	1.84
100-amp. 3 P. S. T	3.76
200-amp. 3 P. S. T	6.76

DISCOUNT—NEW YORK

	High Grade
Less than $10 list	+15% to +10%
$10 to $25 list	+10% to 2%
$25 to $50 list	5%
	Low Grade
Less than $10 list	+5% to list
$10 to $25 list	List to 8%
$25 to $50 list	15%

DISCOUNT—CHICAGO

	High Grade
Less than $10 list	+ 15%
$10 to $25 list	List to 2%
$25 to $50 list	5%
	Low Grade
Less than $10 list	+5%
$10 to $25 list	8%
$25 to $50 list	15% to 16%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List
5-amp. single-pole	250	$0.28
5-amp. single-pole, ind	250	.32
10-amp. single-pole	100	.48
10-amp. single-pole, ind	100	.54
5-amp. three-point	100	.54
10-amp. three-point	50	.76
10-amp., 250-volt, D. P	100	.60

10-Amp., 250-Volt Push-Button Switches

	Std. Pkg.	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	.70

SWITCHES, SNAP AND FLUSH—Continued

DISCOUNT—NEW YORK

Less than 1/5 std. pkg	+20%
1/5 to std. pkg	List
Std. pkg	15% to 17%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg	+30% to 10%
1/5 to std. pkg	+5% to 16⅔%
Std. pkg	18% to 25%

SWITCH BOXES, SECTIONAL CONDUIT

Union and Similar—	List Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	Net to 30%	Net
$2.00 to $10.00 list	10% to 35%	5%
$10.00 to $50.00 list	20% to 37%	10%

DISCOUNT—CHICAGO

	Galvanized	Black
Less than $2.00 list	25% to 40%	20% to 30%
$2.00 to $10.00 list	25% to 50%	20% to 40%
$10.00 to $50.00 list	25% to 64%	20% to 50%

TOASTERS, UPRIGHT

NEW YORK

List price	$6.00 to 6.50
Discount	20% to 30%

CHICAGO

List price	$6.00 to $7.00
Discount	20% to 30%

WIRE ANNUNCIATOR

NEW YORK

	Per Lb. Net
No. 18, less than full spools	$0.54–$0.66
No. 18, full spools	.52– .56

CHICAGO

	Per Lb. Net
No. 18, less than full spools	$0.65 to $0.72
No. 18, full spools	.55 to .605

WIRE, RUBBER-COVERED, N. C.

. Solid-Conductor, Single-Braid

NEW YORK

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$20.00–$25.00	$15.00–$17.00	$15.00–$15.75
12	23.58– 27.09	21.62– 29.09	17.68– 23.22
10	30.20– 37.80	27.45– 32.40	23.47– 32.40
8	42.74– 53.34	38.85– 45.72	33.21– 45.72
6	61.50– 84.42	55.35– 72.36	52.58– 55.48

CHICAGO

	Price per 1000 Ft. Net		
No.	Less than 500 Ft.	500 to 2500 Ft.	2500 to 5000 Ft.
14	$25.00	$18.00–$25.00	$15.50
12	$29.46– 31.44	29.46– 31.44	$25.54– 31.44
10	41.10– 43.84	41.10– 43.84	34.62– 38.36
8	57.00– 61.76	57.90– 61.76	50.18– 54.04
6	85.31– 97.68	85.31– 85.47	77.21– 85.47

WIRE, WEATHERPROOF

Solid-Conductor, Triple-Braid, Size 4/0 to 3 Inc.

NEW YORK

	Per 100 Lb. Net
Less than 25 lb	$39.75 to $44.00
25 to 50 lb	39.75 to 42.00
50 to 100 lb	38.75 to 40.00

CHICAGO

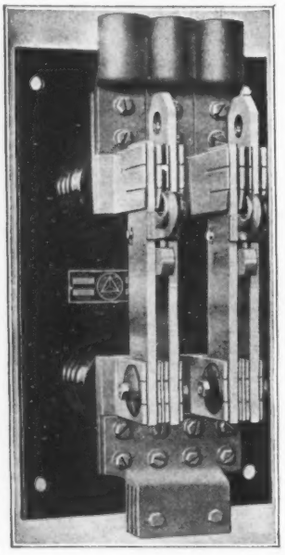
	Per 100 Lb. Net
Less than 25 lb	$41.00 to $41.76
25 to 50 lb	39.75 to 40.76
50 to 100 lb	38.75 to 39.76

NEW APPARATUS & APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Locked-Type Unit Disconnecting Switch

Frequently high-ampere-capacity single-element disconnecting switches are objectionable because of the considerable manual effort necessary to open and close the blades. What is said to be an easily operated locked-type unit



LITTLE EXERTION NECESSARY IN OPENING AND CLOSING

switch is being manufactured by the Delta-Star Electric Company, 2433 Fulton Street, Chicago. The 4000-amp., 6600-volt type illustrated consists of two 2000-amp. elements mounted on common contacts, each unit being independently operated and also provided with safety locks.

Farm-Lighting Generators with Ball Bearings

Farm-lighting generators, either shunt-wound or compound-wound, have just been placed upon the market by the Hendricks Magneto & Electric Company of Indianapolis. Two sizes of these generators are obtainable—the 30-40 volt, 1½-kw. size furnishing current for seventy-five 20-watt lights or their equivalent, while the 30-40 volt, 3-kw. type supplies electricity for 150 20-watt lights. Ball bearings are an important feature of the generator construction and the manufacturers say that the brush area and the windings of both field and armature are of generous proportions. Pulley and base rail are furnished along with the generator.

Notice to Electrical Manufacturers

The Post Office Department has promulgated a new ruling which will affect the New Apparatus and Appliances Section of the ELECTRICAL WORLD. According to the official instructions, no device can be described in our editorial columns unless it is actually new and has not been previously described in the editorial or advertising pages of any periodical. It is explicitly stated that no editorial mention may be given an article advertised in the same issue of the magazine. Moreover, no editorial mention may be written so as to constitute a "puff." Only important features of the article may be described.

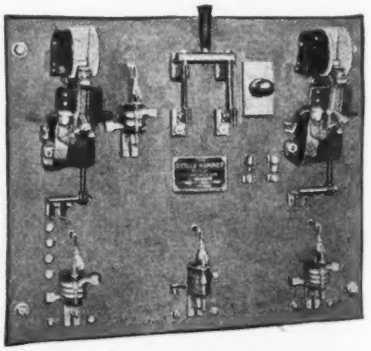
While it has been our policy to describe as new any apparatus which was new to our editorial columns, it now becomes necessary to ask the manufacturers to get such news into our hands before giving their new products any publicity. This policy on the part of manufacturers is, in fact, prerequisite to any editorial mention whatsoever. It is hardly necessary for us to request that only material be sent us which will bear the light of impartial criticism since extravagant claims and all irrelevant matter must be eliminated. Attention should be given those features which differentiate a device from similar apparatus already on the market. It is needless for us to call attention to the fact that the ELECTRICAL WORLD has always been more than willing to inform its readers of all new devices brought out. We feel this service is just as obligatory as any other service which the paper renders its readers, and we have therefore sought to keep the New Apparatus Section up to the same high standard as the rest of the paper.

We would appreciate it very much if we could count on your cooperation in supplying us with descriptions of new devices in conformity with the rules promulgated by the Post Office Department. The editorial department of the ELECTRICAL WORLD has never heretofore stopped to consider whether a device was advertised in its pages or not, the sole criterion being whether it possessed merit and was new. The Post Office Department requires us to be more drastic and to exclude from our columns descriptions of any apparatus which has been advertised at all.

Safety First for Crane and Operator

The average crane cab built a few years ago, before the advent of safety first ideas, and even some cabs now manufactured, give practically no protection to the motors and actually present hazards to the operator. By simply removing the dangerous open switchboard and installing in its place a crane protective panel mounted in a steel cabinet all danger is obviated.

These panels take the place of the various circuit breakers, knife switches, fuses, etc., previously mounted in the crane cab, giving a complete switchboard on which are arranged all the necessary protective devices and safety features. No-voltage and overload protection is provided for each motor supplied through the panel, a thing hardly possible with the usual equipment. The control of the panel is obtained through a push-button station. To start the crane the operator merely depresses the "start" button for an instant before manipulating the motor controllers, requiring far less time than closing numerous circuit breakers and fuses. To shut off the power from all circuits he touches the "stop" button. If he wishes to inspect any motor or leave the crane temporarily in an inoperative condition, he can withdraw the safety plug and take it with him. As a further preventive against starting the crane when it is stopped for any repairs, both the electrician and the crane operator



ALTERNATING-CURRENT PANEL FOR MANUALLY CONTROLLED CRANES

can be provided with separate locks which when inserted in hinged clips of the main-line knife switch prevent it from being closed.

The protecting panels described here are made by the Cutler-Hammer Manufacturing Company of Milwaukee for cranes with alternating or direct-current motors of from 50 hp. to 400 hp.

Vertical-Break Horn-Gap Switch

A new design of horn-gap switch of the vertical-break type has been developed by the Railway & Industrial Engineering Company, Pittsburgh, Pa., and can be had for all voltages up to 150,000. Operation is accomplished by rotating the center insulator. On top of this is mounted a circular gear rack which meshes with a segment gear to which the switch arm is attached. In this way a rotary motion of the insulator raises and lowers the switch arm.

It is pointed out that there is no danger of the switch becoming inoperative because of sleet or winter storms since every point where freezing may occur is guarded. The main contact is of the laminated-brush type covered by a sleet hood of the same general construction as that used in the Burke horn-gap switch. Operation is said to be positive under all weather conditions. Prevention of the main contact burning is provided for by auxiliary arcing horns which make contact before and break after the main contact. The insulators, which are of the sectional type bolted together, provide for replacement of damaged units.

New-Principle Pull Sockets

With the advent of high-wattage heating devices and appliances, it has become necessary to develop a 660-watt, 250-volt pull socket. The Despard & Gordon Company of Chicago has developed a simple and unique quick make-and-break mechanism, with a wide breaking distance. The movement has an oscillating contact arm actuated by an oscillating pawl with an extension or spring connecting both. The contact arm itself has fiber-insulating bearings at each end and a fiber-insulating connector at the end for the spring which

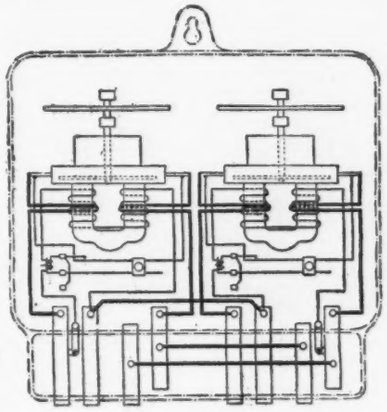
MAY BE USED WITH OR WITHOUT CHAIN

insulates the entire mechanism from the contact arm.

The lever that actuates the mechanism is said to be a step forward in lever construction. It can be pulled in any direction or straight out, riding around a fulcrum. When the lever is pulled in any direction it rights itself quickly and is ready for another pull. The lever and chain can be removed readily for refinishing. Leaving the chain off, the lever can be operated with a slight pressure of the thumb. This is a natural way to manipulate a socket without a chain. The cap and shell were designed to give a positive gripping surface around their entire circumference, allowing at the same time the ready removal of the cap when desired.

Accurate Three-Wire Direct-Current Meter

A three-wire, direct-current service-type meter which will record accurately the load on either side of a three-wire distributing system, regardless of whether the other side of the line is energized or not, is being placed on the market by the Sangamo Electric Company, Springfield, Ill. This meter consists simply of two standard two-wire elements placed side by side on a common base and registering kilo-



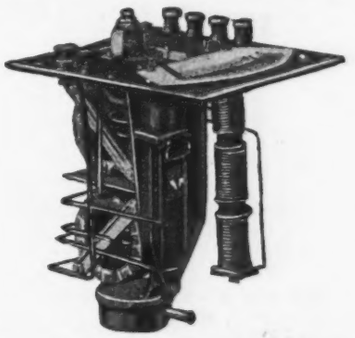
INTERNAL ARRANGEMENT AND CONNECTIONS OF METER

watt-hours on a common recording train so that the sum of the revolutions of the two elements will be properly added and indicated on the kilowatt-hour dial of the meter. This is effected by means of a very simple but ingenious differential gearing within the recording train, so that no matter what load there may be on one element as compared with the other, the total revolutions of the two elements will be accurately added and recorded. Even with one element fully loaded and the other one without load, the registration is as accurate as though each element were recording on a separate train.

Each element of the new three-wire meter includes the light-load adjustment, the damping magnets, and in the case of meters over 10-amp. rating, the internal or external shunts. The elements are so connected through an interchange of connections within the terminal box itself that the load wires from and to the line pass in and out of the meter in regular succession. No crossing over or interchanging of leads is required. In calibrating, each element is considered and tested as a standard two-wire meter without respect to the other element.

Combination Indicating Instruments

Instruments sufficiently accurate for all general testing and so constructed as to withstand the rough usage to which instruments of this character must necessarily be subjected without damaging the internal mechanism or



INDICATING INSTRUMENT WITH UNUSUAL FEATURES

affecting their accuracy are being manufactured by the Esterline Company, Indianapolis, Ind. These instruments are known as the Type "W" indicating instruments. In order to eliminate the necessity of carrying an extra instrument for such testing, a combination has been effected so that a voltmeter and an ammeter, a single-phase wattmeter and voltmeter, a single-phase wattmeter and ammeter, or a polyphase instrument may be inclosed in a single case. This construction makes available two meters in one case, a very convenient arrangement in general testing and trouble duty.

A number of features not heretofore found in portable instruments are included in this line. These features are the elimination of jewels, pivots and hair springs; the use of a steel suspension for supporting the moving elements, which acts also as the restraining medium, and the use of a machined cast-aluminum frame and top plates with a movement frame molded entirely from bakelite.

The instrument is exceptionally light in weight and measures 8½ in. by 8 7/16 in. by 11⅝ in. It weighs approximately 10 lb.

Combined Electric and Hand-Power Dishwasher

For all classes of institutions having a large number of dishes to wash, Redmon, Edgar & Redmon of Cedar Rapdis, Iowa, have developed a combined electric and hand-power dishwasher known as the "E-Z-Way No. 12." It has a capacity of 5000 dishes per hour and occupies a floor space independent of receiving and drying tables of approximately 2 ft. by 3 ft. (61 cm. by 91 cm.). It has attachments for hot water, sewer and gas or live steam where steam is available. The rotary motion of the basket containers for dishes and silverware is supplied by a belt and gear drive with a ¼-hp. motor.

Trade Notes

FEMALE EMPLOYMENT.—Under the title 'Factory Equipment, Housekeeping and Supervision," the Industrial Commission of Wisconsin, women's department, has issued a handbook for employers of women containing the provisions of the statutes regarding labor standards, with suggestions regarding safety, sanitation, equipment and housekeeping and supervision.

WESTINGHOUSE ACQUIRES FRANKLIN "MAZDA."—The Westinghouse Lamp Company purchased a few days ago all of the outstanding capital stock of the Franklin Electric Manufacturing Company, Hartford, Conn., the smallest of the "Mazda' group of lamp manufacturers. The Franklin company was organized in 1900. It has two factories, one in Hartford and the other in Middletown, Conn. General offices are in Hartford, and branch offices are located in New York, Philadelphia, Pittsburgh, Chicago, Elkhart, St. Louis, Los Angeles and San Francisco.

ONE DINNER HOUR FOR JOBBERS.—The Lewis Electrical Supply Company of Boston announces that it has established an effective plan of closing daily, except on Saturdays, between 12 and 1 o'clock as a regular dinner hour. This custom, it is understood, is now being followed by a number of electrical supply jobbers in place of allowing the usual lunch hours and relays, which results in abbreviated service for an hour before and two hours after noon.

AVOIDING DISAGREEMENTS ON EXPERIMENTAL WORK.—A Boston electrical manufacturer who does a large amount of experimental and special work finds the following businesslike policy helpful in preventing errors and safeguarding the financial return for services performed: On experimental or special work a cash deposit is required before work is begun, a certain agreed amount being paid weekly and the balance at the completion of the job. All orders left must be in writing and signed by the person responsible for the payments. Otherwise the manufacturing company will not be responsible for errors. No estimate is considered official for the customer's use unless it is in writing and countersigned by the manager of the establishment asked to bid upon the work.

BRITISH ATTENTION TO KEY INDUSTRIES.—The Key Industries Exhibition held in London on Oct. 8 to 18 under the auspices of the Tariff Reform League is a striking illustration of what Great Britain has accomplished during the war in manufacturing essential commodities which were formerly almost completely controlled by Germany. These key industries, while not necessarily large in themselves, are of vital importance, since upon their existence that of other greater industries depends. England, formerly an importing nation of many commodities, including a large variety of electrical goods, has since the war begun taking steps to establish her own manufacturing plants in these industries, and with the end of the war she expects not only to be able to satisfy the domestic consumption but also to be able to enter into foreign trade.

ELECTRICAL SUPPLIES FOR AUSTRALIA.—A conference of electrical engineers was held in Melbourne, Australia, on July 17 last to deal with the problem of insuring during the next two years the maximum supply of electrical goods from foreign sources. The engineers were attached to central stations all over Australia. It was shown how difficult it is to obtain electrical goods from England and the United States owing to the manufacturers being engaged almost exclusively in war work. An ever-increasing demand for power in Australia requires an increased output and therefore more machinery. The immediate object of the meeting was to get the representative of every central station to compile a schedule of the electrical goods that will be needed during the next two years. These needs, it is understood, will be grouped together and bulk orders given to foreign firms through the Department of Munitions, which, it is reported, will draw the attention of the Munitions Department in London to the needs of Australia. It is anticipated that this grouping and advice of the Australian Munition Department will do much to insure greater and more adequate supply. When completed the result will be reported to the Director of Munitions.

GREATER FACILITIES FOR OHIO BRASS.—The Ohio Brass Company, Mansfield, Ohio, is constructing a service building which will be devoted almost entirely to the comfort and convenience of employees of its factory. The new building stands across the street from the present factory buildings. It has a separate entrance for employees, directly opposite the main entrance of the factory. Immediately inside this entrance is a room 60 ft. by 120 ft. which will be used as a locker room. This room will be fitted with lockers as soon as conditions become more normal and steel is available. In connection with the locker room will be a marble, inclosed shower room and also a plentiful equipment of improved-type lavatories. On the second floor, above the locker room, is a room of the same size which will be used as a lunch room in addition to the company's restaurant, where full meals are served at cost. The new building is constructed entirely of reinforced concrete with a brick facing. Later on there will probably be provided additional facilities for relaxation and recreation. It is planned to improve the grounds around the buildings. While the new service building is primarily for the employees, some of the space will be used for the present for offices in order to relieve congestion in the existing buildings. Space is being turned over to manufacturing purposes as rapidly as possible. In addition to the service building the company has had to add a number of factory buildings in order to handle the extra large amount of business in essential war materials. There is now being completed a 60-ft. by 120-ft. extension to one of the factory buildings and an entirely new steel building 60 ft. by 140 ft. The added space secured by these buildings, together with new manufacturing equipment, will be a material aid in the efforts the company has made and is making, to bring its production up to customers' requirements.

LAMP MEN MEET AT AMERICAN APPLIANCE DINNER.—The second annual dinner given by the American Appliance Company, prominent lamp jobber, 366 West Fifteenth Street, New York City, and Indianapolis, Ind., was held on Nov. 9 at the Hotel McAlpin in New York. In the invitation the company stated that this gathering of its friends in the incandescent-lamp world was "in the nature of an expression of thanks to them for their loyalty and hearty coöperation with us in many ways during the preceding year." Good fellowship was the keynote of the evening, and there was no discussion of business matters. Members of the lamp industry were present from many parts of the country. The guests included the following: Charles Ablett, Charles Ablett & Company; Harry Annin, Federal Division; J. R. Baker, General Electric Company; Frank R. Blaewelt; Ernest S. Blum; E. W. Boyce, New York Lamp Company; James C. Brower; L. R. Claflin, Independent Lamp & Wire Company; Agar Cook; R. K. Dana, Independent Lamp & Wire Company; Dan Delaney, Liberty Lamp Works; E. E. Dorting; Ben F. Erskine, Novelty Incandescent Lamp Company; William H. Evans, William H. Evans & Company; W. D. Fitzpatrick, American Appliance Company; Otto Foell, Lux Manufacturing Company; Arthur Freund, Federal Division; Ben Goldman, Pacific Lamp Company; A. Gordon; George K. Hamblin, Acton Electric Company; H. D. Harding, American Appliance Company; Harvey Harper, Miniature Incandescent Lamp Company; P. H. Harrison, Miniature, Incandescent Lamp Company; Frank Haskell; Theodore Haubner; R. K. Herschman, H. J. Jaeger Company; W. F. Herzog, W. F. Herzog & Company; E. G. Hines, "Electrical World"; H. J. Jaeger, H. J. Jaeger Company; G. M. Jost, American Appliance Company; Charles Kane; Charles Levy, Weehawken Tungsten Lamp Company; Dr A. J. Liebman, Incandescent Lamp & Wire Company; A. C. Mannweiler, A. C. Mannweiler & Company; Frank Marsh, Consolidated Electric Lamp Company; Fred Mays, Lux Manufacturing Company; W. M. Mullaney, Renew Lamp Company; Charles Mumder, M. & W. Company; W. B. Paulscraft; C. T. Pfaltz, Duhrsen & Pfaltz; L. L. Pierce; H. R. Potter; William Roller; F. J. Rooney, F. J. Rooney Lamp Company; M. H. Rosenberg, Liberty Lamp Works; F. D. Rusling, American Appliance Company; A. P Sass, Incandescent Lamp & Wire Company; Roy Schaulin, Franklin Electric Manufacturing Company; Doherty Sheerin, American Appliance Company; Edward Simon, Triumph Lamp Company; John Simon, Carbon Company; George Smith, Renew Lamp Company; E. A. Tighe, Consolidated Electric Lamp Company; John P. Todd; T. F. Vilaghy; F. A. Vosburgh, Vosburgh Miniature Lamp Company; C. F. Wall; E. S. Walsh, Acton Electric Company; F. Walter, Domestic Tungsten Lamp Company; Ray Warman; Frank Watts, Hart Manufacturing Company; John Weiser, Amer-

ANNUAL DINNER OF THE AMERICAN APPLIANCE COMPANY AT HOTEL McALPIN, NEW YORK CITY

ican Appliance Company; E. Weingarter; Frank Weller, Vosburgh Miniature Lamp Company; Alfons Wile; Irwin Wile; Oscar J. Wile; A. E. Weist, American Appliance Company; G. V. Williams, Guy V. Williams Company.

T. R. DuBOIS, formerly of the Bijur Motor Lighting Company, Hoboken, N. J., is now associated with the United States Light & Heating Corporation, Niagara Falls, N. Y.

J. A. MURPHY, new-business manager of the Wheeling (W. Va.) Electric Company, has resigned to take the managership of the Wheeling branch of the Hoover Suction Sweeper Company, with offices in the Rex Theater Building.

G. A. BINZ, sales manager for the Yarnall-Waring Company, Philadelphia, has transferred his headquarters to the company's New York office at 90 West Street and will in future devote his whole time to the interests of "Yarway" specialties in that area.

THE BOONTON (N. J.) RUBBER MANUFACTURING COMPANY, making composite insulation, has been investigated by A. Mitchell Palmer, Alien Property Custodian, who will offer for sale on Dec. 23, 5001 shares of the capital stock of the company, par value $100.

THE UNDERFEED STOKER COMPANY of America announces that E. L. Beckwith has been placed in charge of the Cincinnati office, 926-927 Union Central Building, taking the place of S. A. Williamson, who has been transferred to Minneapolis, with offices at 637 Plymouth Building.

T. K. STEVENSON, formerly sales manager for the Western Electric Company at St. Louis, has been transferred to the company's government department at New York, where he will do special work. George Corrao, who replaces Mr. Stevenson at St. Louis, has been appointed assistant sales manager at that house.

THE MONARCH REFILLABLE FUSE COMPANY, Buffalo, N. Y., announces the appointment of L. I. Geyer of Buffalo as assistant manager of the company. Frank H. Kaiser, who has been connected with the company since its organization, has disposed of his interests and is no longer connected with this concern. The Monarch company has also engaged the services of Prof. J. F. Putnam, of the electrical laboratories of Cornell University, as consulting engineer.

THE EMERSON ELECTRIC MANUFACTURING COMPANY, St. Louis, Mo., has announced that for many reasons it is impossible to determine prices and selling plans for 1919. The company has usually been in a position to state next season's plans for the wholesalers by the first of November, but it will probably be several weeks after that date before the 1919 plans are ready, the company says. It will issue notice of the plans at the earliest practicable moment.

F. Y. STEWART has been appointed manager of the tape department of the United States Rubber Company, with headquarters at the main office of the company in New York. Mr. Stewart was manager of the Walpole Tire & Rubber Company from the time it was bought until it was finally absorbed by the United States Rubber Company about three years ago. The Walpole friction tape is now manufactured, sold and distributed by the various branches of the United States Rubber Company in the chief cities of the United States.

THE MILLIKEN BROTHERS MANUFACTURING COMPANY, Inc., Woolworth Building, New York, recently organized to succeed Milliken Brothers, Inc., has acquired the plant of the James H. Young Stone Company, One Hundred and Thirty-sixth Street and East River, New York City, for a new steel-fabricating plant. The structure is of mill-building type and provides about 40,000 sq.ft. of manufacturing area. The plant is provided with an overhead electric traveling crane and other modern handling equipment and will have a complete allotment of machinery and apparatus for the manufacture of the different steel specialties of the company, including transmission and radio towers and steel poles. An adjoining piece of land has also been purchased, making an aggregate of about two acres of property, with rail and water facilities available for the new works. On this latter site it is planned to build a modern galvanizing plant with complete equipment to handle steel transmission and radio towers as well as other work.

THE SCIENTIFIC PRODUCTS COMPANY, manufacturer of heating pads, Steubenville, Ohio, has gone into bankruptcy, and John A. Huston has filed his first report as trustee. This report will be examined and passed upon on Nov. 18 at Steubenville. At this time the first dividend will be declared.

ELECTRICS, LIMITED, has opened offices at 22 St. John Street, Montreal, Canada, with the following officers: Stephen H. Wiggett, president; Andrew C. Hersey, vice-president; G. H. Rainville, managing director. The firm is wholesale distributer for Westinghouse "Mazda" lamps, and also for motors, generators and other electrical equipment maunfactured by the Westinghouse Electric & Manufacturing Company of the United States.

E. E. STRONG entered the electric supply business on Nov. 1 with Henry I. Shiefer & Company, district engineering and sales representatives in central New York for the Sangamo Electric Company, Delta Star Electric Company, G. & W. Electric Specialty Company, Condit Electrical Manufacturing Company and Moloney Electric

E. E. STRONG

Company, in addition to being local representative for Western Electric power apparatus. Mr. Strong's office will be in Rochester. He has been superintendent of transportation of the New York State Railways, Rochester lines, for the past five years or more, and since his graduation from the Syracuse University in 1908 has been connected in different capacities with the electric railway industry in the State of New York.

Trade Publications

FIREBRICK LINING.—Plastic firebrick lining for boiler use is the subject of a folder from the Betson Plastic Fire Brick Company of Rome, N. Y.

LIQUID HEATER.—An electric heater for medicinal solutions is illustrated and described with directions for use in a leaflet of the William H. Dalton Company at Salem, Mass.

BUFFING AND GRINDING MOTORS.—Specifications, descriptions and illustrations of both pedestal and bench-type buffing and grinding motors make up a leaflet from the U. S. Electrical Manufacturing Company of Los Angeles, Cal.

INDICES.—An index to the October, 1918, descriptive bulletins and sheets, and another of the October, 1918, supply parts bulletins of the General Electric Company, have just been published by the publication bureau of the company at Schenectady, N. Y.

WASHING MACHINES.—The "Almetal" household steam laundry, which is gas-heated and electrically operated, is dealt with in a two-color leaflet prepared by the Manufacturers' Distributing Company, 400 Fullerton Building, St. Louis, and entitled "If Men Had to Do the Washing?"

LIGHTING GENERATORS.—Lighting generators for automobile, motorboat and large and small farm-lighting outfits form the subject of a new booklet being distributed by the Hendricks Magneto & Electric Company, Indianapolis, Ind.

POSTER STAMPS.—Dealers are urged by the Benjamin Electrical Manufacturing Company of 806 West Washington Boulevard, Chicago, to use Benjamin two-way plug "posterettes" on letters, bills, packages and signs. A mailing card issued contains a return postal card for obtaining a supply.

CUT-OUT BASES.—"Noark" main-line and branch cut-out bases for National Electrical Code standard fuses form the subject of a seventeen-page booklet recently issued by the H. W. Johns-Manville Company, Madison Avenue and Forty-first Street, New York City. Prices are included.

POWER-PLANT APPLIANCES.—Eleven different bulletins of the Sims Company, Erie, Pa., have been issued bound together. They describe with illustrations feed-water heaters, hot-water generators and converters, steam-tube storage heaters, gas-engine economizers, garbage burner, steam separators, exhaust heads, oil extractors, oil filters and tanks.

VULCANIZED FIBER.—Two new sixteen-page illustrated booklets have been published by the American Vulcanized Fibre Company of Wilmington, Del., descriptive of their product. The titles are "Vul-Cot Fiber—the Material with a Million Uses," and "Vul-Cot Fiber—Special Catalog of Parts for Electrical, Mechanical, Automobile and Railroad Uses."

PROJECTOR LIGHTING.—The important part being played by outdoor floodlighting for night work and protective purposes is explained in a new booklet published by the National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago. Thre new projectors and several new silver-mirrored reflectors for projectors are featured in this bulletin.

STORAGE BATTERIES.—Revised editions of two illustrated catalog sections, A and B and V, describing respectively the "chloride accumulator" and the "Tudor accumulator," with parts and accessories, and the "Exide," "Hycap-Exide" and "Thin-Exide" batteries for electric vehicles, have been got out by the Electric Storage Battery Company of Philadelphia. Price lists may be obtained with these catalogs.

New Incorporations

THE PENNSYLVANIA ELECTRIC REPAIR COMPANY of Pittsburgh, Pa., has been chartered with a capital stock of $25,000 by Alexander McLean and others.

THE CHAMBLEE (GA.) LIGHT & POWER COMPANY has been incorporated with a capital stock of $50,000 by L. C. Van Ornum, H. J. Plade and Emil Baretch.

THE AUBURN (WASH.) BATTERY & ELECTRIC COMPANY has been incorporated with a capital stock of $5,000 by F. M. Russell, C. C. Hayes and A. F. Anderson.

THE BRANFORD ELECTRIC COMPANY of New York, N. Y., has been incorporated by E. L. Bell, D. Sprague and M. J. Conklin. The company is capitalized at $10,000 and proposes to manufacture electrical specialties.

THE PORTER ELECTRIC LINE COMPANY has filed articles of incorporation with a capital stock of $6,000 for the purpose of supplying electricity in the vicinity of Porter and Evansville, Wis. The incorporators are: Joseph E. Porter, F. F. Miller and J. K. Porter.

THE HOME ELECTRIC COMPANY of Eureka Springs, Ark., has been organized by B. H. Blockson, F. A. Butt, C. A. Fuller and others. The new company will take over the property of the Eureka Springs Electric Company, including the electric light plant and ice factory.

H. W. BARTLETT, INC., of New York, N. Y., has filed articles of incorporation with a capital stock of $10,000 for the purpose of doing a general electrical engineering business. The incorporators are: H. W. Bartlett, C. J. Beck and C. W. Bedell, 23 Mercer Street, New York City.

THE INTERSTATE POWER COMPANY of Lancaster, Wis., has been organized by C. E. Blake, W. J. P. Aberg and C. H. Beyer of Maidson, Wis. The company is capitalized at $1,000,000 and proposes to furnish electricity for lamps and motors in Grant, Crawford and Richland Counties in Wisconsin and in five counties in Iowa.

New England States

PORTLAND, ME.—Owing to the settling of the drawbridge between Portland and South Portland, the Cumberland County Light & Power Company has decided to relay its submarine cables between Portland and South Portland, increasing the length 760 ft. Two new cables for 4-0, 2300-volt service will be installed.

PORTSMOUTH, N. H.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Nov. 18 for installing one 35-ton and one 15-ton electric traveling crane in machine shop extension at Portsmouth, under Specification 3502. The cost is estimated at about $35,000

BONDSVILLE, MASS.—The Boston Dock Company has acquired the water power and the real estate connected with it at Barrett's Junction from the estate of Daniel B. Wesson of Springfield. The company, it is expected, will establish a power plant there in the near future. Two power plants are already operated by the Boston Duck Company.

CHATHAM, MASS.—Plans have been prepared by the Navy Department, Washington, D. C., for the installation of a new boiler plant at the local naval station, to cost about $30,000.

HINGHAM, MASS.—The United States government is contemplating the construction of a T.N.T. plant at Hingham, to cost about $150,000.

SOMERVILLE, MASS.—The American Woolen Company, 245 State Street, Boston, is contemplating the construction of a mill, 100 ft. by 270 ft., in Somerville, to cost about $200,000.

NORWICH, CONN.—The Shore Electric Railway Company of Norwich has petitioned the War Department for permission to erect a high-tension electric transmission line across Winthrop Cove and the railroad bridge.

WATERBURY, CONN.—The Connecticut Light & Power Company has petitioned the Superior Court to appoint a committee to proceed with condemnation proceedings to obtain land in Newtown in connection with the construction of a large dam on the Housatonic River in Newtown.

Middle Atlantic States

BUFFALO, N. Y.—Plans have been prepared by the Star Eloetrode Company, Buffalo Avenue, for the construction of a new two-story service building, about 80 ft. by 80 ft.

FLUSHING, N. Y.—The New York & Queens Electric Light & Power Company has acquired property having a frontage of 150 ft. on Lawrence Street, Flushing, near Flushing Creek.

FORT LAFAYETTE, N. Y.—Plans are under consideration by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for the installation of a new lighting system, to cost about $6,000, at Fort Lafayette.

NEW YORK, N. Y.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Nov. 25 for an electrically operated traveling crane for the structural shop at the local navy yard, under Specification 3438, to cost about $40,000.

PORT RICHMOND, N. Y.—Plans have been prepared by H. L. Harding, architect, 52 Vanderbilt Avenue, New York City, for a marine terminal for the Port Richmond Terminal Company at Port Richmond. The project will involve an expenditure of about $2,500,000 and will include two steel sheds, four warehouses, tracks between sheds and water front, etc.

RICHMONDVILLE, N. Y.—The Public Service Commission has authorized the Great Bear Light & Power Company of East Worcester to transfer to the village of Richmondville its entire lighting system and plant east of the Otsego County line and the rights and franchises heretofore granted to it by the town and village of Richmondville.

SCHENECTADY, N. Y.—Plans are being prepared by the General Electric Company for extensive additions and repairs to its plant in Schenectady. Among the improvements are included the installation of a new sewage pumping plant in building 212 and a new substation for power for building 95-B. The substation will be 111 ft. by 49 ft. and will cost about $30,000.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

NEWARK, N. J.—The General Lead Batteries Company, 4 Lister Street, has leased the building at Central Avenue and Lock Street, about 50 ft. by 150 ft., to provide for proposed extensions.

FARRELL, PA.—The new power plant of the American Sheet & Tinplate Company, which will furnish electricity to operate both the tin plate and sheet mills, has been placed in operation. The equipment includes two 1200-kw. Westinghouse generators. Power service has been provided by the Carnegie Steel Company for a number of years. The power plant represents an expenditure of about $1,000,000.

PHILADELPHIA, PA.—Bids will soon be asked by the Ordnance Department, Washington, D. C., for the construction of a woodworking and carpenter shop at the Frankford Arsenal, to cost about $200,000.

PHILADELPHIA, PA.—Contract has been awarded by the Bell Telephone Company to the F. L. Hoover & Sons Company, 1023 Cherry Street, for extensions and alterations to its building at 26 West Chelton Avenue, Germantown.

PHILADELPHIA, PA.—Steps have been taken by the Pennsylvania Railroad Company, the Baltimore Railroad Company and the city of Philadelphia to establish a new railroad yard and freight terminal in the vicinity of Government Street and Jones Lane, near League Island. It is proposed to erect storage buildings, freight houses and other buildings, equipped with hoisting and conveying machinery for the use of both railroads as well as the Schuylkill River East Side Railroad.

PHILADELPHIA, PA.—The contract for the construction of the submarine battery storage building at the Philadelphia Navy Yard has been awarded by the Bureau of Yards and Docks, Navy Department, to the Turner Concrete Steel Company, 1713 Sansom Street, to cost about $125,000. Contract has also been awarded to the Industrial Engineering Company, 30 Church Street, New York, N. Y., for the erection of a storehouse at the local navy yard, equipped with hoisting and conveying machinery, etc., to cost about $1,263,000.

PITTSBURGH, PA.—A section of the substation of the Duquesne Light Company in the North Side district was recently damaged by fire. The company, it is understood, will rebuild immediately.

THROOP, PA.—Contract has been awarded by the Price-Pancoast Coal Company of Scranton for the construction of its electric power plant at Throop to Salvatore Palumbo, Real Estate Exchange Building, Scranton. The cost of the plant with equipment is estimated at $75,000.

BALTIMORE, MD.—The Bartlett-Hayward Company, Scott and McHenry Streets, Baltimore, is planning to erect three additional buildings and also a boiler plant at its works at Turner's Station, Md.

BALTIMORE, MD.—A. S. Goldsborough of the War Industries Board, 111 East Redwood Street, Baltimore, and the Baltimore Real Estate Board have been authorized by the United States government to look for a site of 150 acres for the establishment of a nitrate plant.

BALTIMORE, MD.—Contracts have been awarded by the Baltimore & Ohio Railroad and the Western Maryland Railroad Companies of Baltimore to the Price Construction Company, Maryland Trust Company, for the construction of new railroad shops and repair work at Connellsville, Pa., to cost with equipment about $250,000 and $100,000 respectively.

HAMPTON ROADS, VA.—Contract has been awarded by the War Department, Washington, D. C., to John Gill & Sons, Cleveland, Ohio, for the construction of an electrical feeder and distribution system at the naval training camp and hospital at Hampton Roads.

NORFOLK, VA.—Plans are under consideration by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for the construction of an emergency hospital at Norfolk, to cost about $1,500,000 (Specification 3620).

RICHMOND, VA.—Plans are being prepared by Alfred M. Quick, engineer, 706 Munsey Building, Baltimore, Md., for the construction of flour mill, hydroelectric power plant and dam, to cost about $100,000.

WASHINGTON, D. C.—Plans have been prepared by the War Department for the establishment of six large plants for repair work on the motor transport equipment for the army, to be located as follows: Camp Holabird, Baltimore, Md.; Atlanta, Ga.; Fort Sam Houston and El Paso, Tex.; Chicago, Ill., and San Francisco, Cal.

WASHINGTON, D. C.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 27 for furnishing and installing lighting fixtures in the United States post office buildings at Burlington, N. C.; Columbia, S. C.; El Paso, Tex.; the United States post office and court house at Chadron, Neb., and federal building at Glenwood Springs, Col. For details see Searchlight Section.

WASHINGTON, D. C.—Bids will be received at the General Engineer Depot, United States Army, 1438 U Street, Washington, D. C., until Nov. 19, under Proposal 1501, for lamp sockets, cut-outs and lighting material; Proposal 1502—knobs, tubes, insulators and lighting material. Bids will also be received until Nov. 22 as follows: Proposal 1503—900 miles of bare copper wire; Proposal 1504—2650 miles of bare copper wire. Further information may be secured on application to the above office.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations supplies as follows: Eastern and Western yards, Schedule 6795½—crane trucks and storage batteries; Schedule 6805½—167 trainers' foot switches. Boston, Mass.—Schedule 6807½—25-hp. motors; Schedule 6891½—two electric hoists. F.o.b. works, Schedule 6808½—one refrigerating apparatus. Sayville, L. I., Schedule 6816½—25,000 ft. silicon bronze wire. Portsmouth, N. H., Schedule 6333½—ammeters and voltmeters. Mare Island, Cal., Schedule 6839½—72 electric portable drills. Philadelphia, Pa., Schedule 6841½—one generating outfit. Washington, D. C., Schedule 6878½—two motor generating sets. Brooklyn, N. Y., Schedule 6879½—four turbogenerating sets. Boston, Mass., Schedule 6883½—65 tables and under-drivers, 13 one-hp. motors and 85 sewing machines. Applications for proposals should designate the schedule desired by number.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations supplies as follows: Brooklyn, N. Y., Schedule 6821½—motor-driven hacksaws. F.o.b. works, Schedule 6900½—electrical material; Schedule 7009½—650,800 lb. chain cable. Boston, Mass., Schedule 6988½—200 transmitters; Schedule 6899½—cable terminals, insulated fiber, 415 vibrating bells and 200 buzzers and annunciators. Philadelphia, Pa., Schedule 7005½—350 storage batetries. Norfolk, Va., Schedule 7007½—brass wire. Bids will also be received until Nov. 22, as follows: F.o.b. works, Schedule 6912½—for ten generators. Norfolk, Va., Schedule 6932½—motor generators. Washington, D. C., Schedule 6935½—25 radio buzzer transmitters; Philadelphia, Pa., Schedule 6968½—telephone cable. Brooklyn, N. Y., Schedule 6974½—1000 ft. of cord and 1000 ft. of wire. Bids will be received until Nov. 18 for the following supplies: Eastern yards, Schedule 6927½—battery-charging outfits Washington, D. C., Schedule 6939½—10,000 dry-cell batteries; Schedule 6918½—motor generator set. Mare Island, Cal., Schedule 6928½—Lamp wire, magnet and wire annunciator cord. Application for proposal blanks should designate the schedule desired by number.

North Central States

CALEDONIA, OHIO—The local electric light plant has been abandoned and an electric transmission line is being erected from the plant of the Columbus, Delaware & Marion Railway Company at Marion.

CLEVELAND, OHIO.—Contract has been awarded by the Willard Storage Battery Company to the Gaylord W. Feaga Company, Citizens' Bank, Building, for the erection of a two-story warehouse, 35 ft. by 205 ft., to cost about $50,000.

GERMANTOWN, OHIO—Negotiations have practically been completed between the city authorities and the Dayton (Ohio) Power & Light Company for taking over the local municipal electric light and power plant. The company has petitioned the Public Utilities Commission for permission to issue $26,000 in capital stock to carry out the project.

LIMA, OHIO.—Plans, it is reported, are under consideration by the Garford Motor Company for extensions to its local plant, to cost about $300,000.

YOUNGSTOWN, OHIO—The Mahoning & Shenango Railway & Light Company has petitioned the Public Utilities Commission for authority to issue $485,000 in bonds, the proceeds to be used to retire a bond issue of $194,000 and the remainder for improvements to its system.

CORBIN, KY.—The plant of the Corbin Ice & Carbonating Company was recently destroyed by fire, causing a loss of about $10,000.

GALENA, ILL.—Arrangements are being made by the Interstate Light & Power Company for two extensions to the government acid plants at Cuba City and New Diggings and for extending the Mineral Point transmission line into the Platteville substation.

GREAT LAKES, ILL.—The Bureau of Yards and Docks, Navy Department, is planning to erect an addition to the outgoing detention group of buildings, to cost about $602,000 (Specification 3621).

EVANSVILLE, WIS.—The Porter Electric Line Company, recently incorporated with a capital stock of $6000, proposes to supply electricity to the farmers in the vicinity of Porter and Evansville. Joseph E. Porter, F. F. Miller and J. K. Porter are interested in the company.

HAYWARD, WIS. — The American Veneer Company, recently incorporated with a capital stock of $100,000, is planning to build a veneer and hardwood products plant, to cost about $75,000. The plant will be equipped for electrical operation.

MILWAUKEE, WIS.—Owing to the increase in demand for electrical service the Milwaukee Electric Railway & Light Company is considering the construction of a new electric power plant.

OSCEOLA, WIS.—The Osceola Milling Company has engaged the Millford Manufacturing Company, 303 South Third Street, Minneapolis, Minn., to design and construct a new power plant and mill addition, 30 ft. by 87 ft., four stories high.

MINNEAPOLIS, MINN.—The Northern States Power Company has been authorized by the Capital Issues Committee to sell a large block of its first and refunding mortgage bonds, the proceeds to be used for improvements. The company operates electric light and power, gas, steam heat and other utilities in Minneapolis, St. Paul and 170 communities in Minnesota, Wisconsin, Illinois, North Dakota, South Dakota and Iowa.

WORTHINGTON, MINN.—Plans have been completed by the Charles L. Pillsbury Company, Metropolitan Building, Minneapolis, for an addition to the municipal electric light plant. W. H. Buchan is city clerk.

ALTENBURG, MO.—The plant of the Altenburg Light & Power Company was recently destroyed by fire.

KANSAS CITY, MO.—Plans have been prepared by the engineering department for a machine shop at the Quindaro pumping station. W. G. Goodman is chief engineer.

MARSHFIELD, MO.—An election will soon be held to submit to the voters the proposal to issue $15,000 in bonds for the purchase of the local electric light plant.

ST. LOUIS, MO.—Plans are being prepared by the Inland Machine Company, 1500 North Broadway, St. Louis, for the construction of a two-story-and-basement building, 200 ft. by 300 ft., to cost about $150,000. O. G. Stark is president.

SLATER, MO.—At an election held Oct. 29 the proposal to issue $25,000 in bonds for extensions to the municipal electric light plant was carried. The installation of new boilers is included in the proposed improvements.

SCRANTON, N. D.—The Johnson Fuel Company is planning to install an electric light plant in Scranton. C. A. Johnson of Fairfax, S. D., is president of the company.

OMAHA, NEB.—Plans are under consideration by the Union Pacific Railroad Company for the erection of a new machine shop at Eighth and Cass Streets, to cost about $200,000.

WICHITA, KAN.—The Arkansas Valley Interurban Railway Company has acquired a site on Douglas and Waco Avenues on which it proposes to erect shops and depot.

GLEN ELDER, KAN.—The Council is considering connecting the municipal lighting system with the power plant at the Kaull Milling Company to distribute electricity for lighting the town. The municipal plan was recently destroyed by fire.

Southern States

MONROE, N. C.—Plans are under consideration by the managers of the Bearskin Cotton Mills for the installation of an electric lighting system in the mill village.

MONROE, N. C.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Nov. 25 for construction of twenty radial brick towers for naval high-power radio station here. (Specification 3600). The cost is estimated at $3,000,000.

ATLANTA, GA.—Machinery for the proposed cotton-duck plant at the United States Penitentiary at Atlanta has been purchased by the Department of Justice, Washington, D. C. The equipment includes 500 looms and 71 twisting frames. The plant will be equipped for electrical operation. The cost is estimated at $1,000,000.

DUBLIN, GA.—The Farmers' Co-operative Association, which operates a co-operative store in Dublin, would like to receive prices on lighting systems, gas engines, farm implements, etc. J. R. Cherry of Dublin is manager.

FORT McPHERSON, GA.—Contract has been awarded by the Construction Division, War Department, Washington, D. C., for the construction of a hospital building, to cost about $500,000. General R. C. Marshall, Jr., Seventh and B Streets, S. W., is in charge of construction division.

STILLMORE, GA.—A. C. Price, it is reported, would like to receive prices on a 20-kw. generator (second-hand). A larger size would be considered.

CRESCENT CITY, FLA.—Bonds to the amount of $10,000 have been authorized for the installation of an electric lighting system in Crescent City. A. E. Lounds is city clerk.

KINGSPORT, TENN.—The chloride distilling building at the government chemical plant in Kingsport was recently destroyed by fire, causing a loss of about $100,000.

BIRMINGHAM, ALA.—Condemnation proceedings have been started by the United States government for the acquisition of a strip of land in Walker County for the construction of a branch railroad, in order to establish a line of communication between the power plant of the Alabama Power Company at Gorgas and the new nitrate plant No. 2 of the government at Muscle Shoals. Approximately 186,000 hp. of electricity, it is understood, will be required to operate the plant. Work has been started on the construction of the first unit of the nitrate plant.

TUSKEGEE, ALA.—Plans are being prepared for rebuilding the shops at the Tuskegee Normal and Industrial Institute. The industrial and trade building was recently destroyed by fire, causing a loss of about $100,000.

EUREKA SPRINGS, ARK.—The property, including both ice and electric plants, of the Eureka Springs Electric Company has been purchased by the Home Electric Company, recently organized by B. H. Blockson, F. A. Butt, C. A. Fuller and others.

ALEXANDRIA, LA.—Plans are under consideration for the construction of a hydroelectric power plant, irrigation and navigation systems. It is proposed to divert the water of Red River to the Gulf. Welman Bradford, engineer, is interested in the project.

ENID, OKLA.—The Oklahoma Garage & Sales Company is considering the purchase of complete equipment for a motor-vehicle repair shop.

Pacific and Mountain States

ABERDEEN, WASH.—Several new buildings, including a tin shop, tree-nailing building and planing mill, are being erected at the Grant Smith-Porter Shipyards at Aberdeen. New equipment, including two electrically operated derricks, band saw, ripsaw, etc., will be installed.

BREMERTON, WASH.—Bids will be received by the Bureau of Yards and Docks, Navy Department, Washington, D. C., until Dec. 2 (extension of date) for improvements to power plant at the Puget Sound Navy Yard (Specification 3298).

SEATTLE, WASH.—The substation of the Puget Sound Traction, Light & Power Company at Seventh and Jefferson Avenue was recently destroyed by fire, causing a loss of about $100,000. The station was equipped with ten large transformers, necessary switchboards, dynamos and converters, etc.

SPOKANE, WASH.—The Spokane Heat, Light & Power Company has been authorized by Federal Judge Rudkin to issue $60,000 in receiver's certificates, the proceeds to be used for extension of its heating service in Spokane.

SPOKANE, WASH.—The United States government, it is reported, is considering the establishment of a nitrate plant near Long Lake, possibly near the site of the Washington Water Power Company. The government has asked the power company to furnish rates on power. The cost of the proposed plant is estimated at about $500,000.

TACOMA, WASH.—The contract for the construction of building 100 houses in Capital Heights has been awarded to the Todd Dry Dock & Construction Company. The necessary extensions of electric lighting and sewer service will be taken care of by the City Council.

PORTLAND, ORE.—An order has recently been placed by the Pacific Coast Steel Company of Portland for transformers having a total capacity of 1500 kw.

PORTLAND, ORE.—Plans have been completed by the Northwestern Electric Company of Portland for the erection of a large oil tank at the foot of Lincoln Street on the harbor line. The building will cost about $18,000.

CHICO, CAL.—Contracts have been awarded by George Welch, secretary and manager of the Phelan interests, for pumps, motors and culverts, amounting to about $30,000, for the proposed irrigation system to be installed on the Phelan ranch. The cost of the entire irrigation system is estimated at about $60,000.

EL CENTRO, CAL.—Plans are under consideration by the Utah Construction Company for the erection of a telephone line from El Centro to the grading camp in the mountains.

OAKDALE, CAL.—An agreement has been reached by which the old Knight's Ferry power plant will again be put into operation in order to supply power to munition and shipbuilding plants around the bay. About $5,000 has been expended to put the plant in running order.

OAKLAND, CAL.—Plans are being prepared by H. A. Broberg, architect, 845 California Street, San Francisco, for the erection of several factory buildings at Melrose for the National Lead Company, Merchants' Exchange Building, Oakland, to cost about $300,000.

SAN FRANCISCO, CAL.—The Sierra & San Francisco Power Company of San Francisco and the Coast Counties Gas & Electric Company of Santa Cruz have petitioned the State Railroad Commission for an extension of time in which they must reconstruct their overhead lines in order to comply with the law of safety in reference to telephone and other electric lines.

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company has been authorized by the State Railroad Commission to issue $5,000,000 in bonds, to be sold at 85, or $5,000,000 in capital stock, to be sold at not less than $82.50, the proceeds to be used to reimburse the treasury of the company for capital expenditures made before May 31, 1918, and to finance future construction work.

PROVO, UTAH.—The Beaver River Power & Light Company of Provo has changed its name to the Telluride Power Company and increased its capital stock from $400,000 to $1,000,000.

GREAT FALLS, MONT.—The Great Northern Railway Company is considering improvements to its local yards, including the erection of new shops, to cost about $250,000. A. H. Hogeland of St. Paul, Minn., is chief engineer. Through error this item appeared under Great Falls, Ont., in the issue of Nov. 9.

GREAT FALLS, MONT.—The new substation of the Montana Power Company at Tenth Street and First Avenue is nearly completed. The building and equipment will represent an expenditure of about $200,000 and is designed to provide for power requirements of the city for many years to come

Canada

POWELL RIVER, B. C.—The Powell River Pulp & Paper Company contemplates rebuilding its mills, at a cost of about $40,000.

WINNIPEG, MAN.—The Campbell-Gray-Carey Company is planning to rebuild its factory, recently destroyed by fire. The loss is placed at $350,000.

Record of Electrical Patents

Notes on United States Patents

1,280,576. ELECTRODE HOLDER FOR ELECTRIC FURNACES; Sergius Steinberg and Igor Gramolin, Motowilichi, Russia. App. filed July 19, 1916. Relates to furnaces of resistance type for melting steel.

1,280,582. RAILWAY AND LIKE SIGNALING; Reuben W. Tarrant, London, England. App. filed Feb. 12, 1916. Contact of wheels on both rails closes circuit.

1,280,587. ELECTRICAL SUPPLY SYSTEM AT CONSTANT-CURRENT STRENGTH AND VARYING VOLTAGE; Rene Thury, Geneva, Switzerland. App. filed March 30, 1916. For exciting generator or motor for better regulation and greater stability.

1,280,594. OVERLOAD SWITCH OR CUT-OUT; Pieter G. van Wijk, Geldermanlsen, Netherlands. App. filed May 23, 1916. Relates to automatic overload switches having delayed or retarded action.

1,280,609. AUTOMATIC TELEPHONE SYSTEM; Bernard D. Willis, Chicago, Ill. App. filed May 2, 1914. Traffic trunk provided from which ringing current is disconnected without reversing current on calling line for sufficient interval of time to cause operation of measured service device on that line.

1,280,624. MOTOR-CONTROL SYSTEM; Ernst F. W. Alexanderson, Schenectady, N. Y. App. filed April 1, 1916. Relates to the operation of induction motors used for propelling railway vehicles and more especially to parallel operation of plurality of such motors.

1,280,659. AUTOMOBILE SEMAPHORE; James M. Canfield, Claremont, Cal. App. filed Oct. 30, 1916. For use on automobiles and arranged to indicate to occupants of other vehicles and to pedestrians direction in which it is intended to turn.

1,280,661. ELECTROMAGNETIC SWITCH; Eugene R. Carichoff, Schenectady, N. Y. App. filed Nov. 7, 1914. Characterized by improved magnetic circuit rugged and compact construction.

1,280,655. SWITCH FRONT PLATE; Stephen F. Briggs, Milwaukee, Wis. App. filed Sept. 13, 1915. Means for connecting front plate of switch with switch frame in such a manner that connection will be invisible.

1,280,705. APPARATUS FOR SIGNALING; Fulton Gardner, Chicago, Ill. App. filed June 22, 1917. Sound-operated protective device for use with bank vaults, safes, etc.

1,280,709. INDICATING MEANS FOR ELECTRICALLY HEATING FLATIRONS; Edward L. Glass, Chicago, Ill. App. filed Jan. 12, 1918. Resistance wire disposed in series with heating element will glow as long as current passes through it and get cold as soon as current is turned off.

1,280,713. RHEOSTAT; Maurice M. Goldenstein, Milwaukee, Wis. App. filed April 4, 1914. Movable contact member rests squarely on selected contact or contacts.

1,280,714. TELEPHONE SYSTEM; Charles L. Goodrum, New York, N. Y. App. filed March 29, 1917. Utlizing magneto telephone receiver in transmission of voice currents, means are provided to amplify minute voice currents.

1,280,733. ELECTRIC SWITCH; Karl Hohn, Zurich, Switzerland. App. filed Jan. 23, 1917. Improved releasing mechanism for automatic overload switches, no-voltage circuit breakers, lock switches or like devices.

1,280,751. TELEPHONE SYSTEM; Kenneth S. Johnson, Jersey City, N. J. App. filed Sept. 25, 1917. Operator's telephone circuit when connected to telephone line is efficient for both talking and receiving, and when bridged across talking circuit between subscribers for monitoring purposes will not materially decrease transmission efficiency of talking circuit.

1,280,752. TELEPHONE-EXCHANGE SYSTEM; Lewis H. Johnson, Bloomfield, N. J. App. filed March 21, 1917. To reduce number of contacts in ringing circuit of ringing system commonly known as four-party "selective" or "semi-selective code."

1,280,768. WIRELESS SIGNALING SYSTEM; Irving Langmuir, Schenectady, N. Y. App. filed Dec. 29, 1913. To receive signals produced by waves of determined frequency to exclusion of signals produced by waves of different frequency.

1,280,769. SYSTEM OF DISTRIBUTION; Irving Langmuir, Schenectady, N. Y. App. filed March 31, 1914. Direct currents having voltage at least as great as those now used in alternating-current transmission may be obtained and economically transmitted to great distances.

1,280,776. ENGINE STARTER; Paul M. Lincoln, Pittsburgh, Pa. App. filed March 24, 1914. Employs electric motor for making initial turns of engine shaft, whereupon motion of engine shaft releases connection.

1,280,782. AUTOMATIC RELEASE FOR TELEPHONE SYSTEMS; Fritz Lubberger, Chicago, Ill. App. filed June 16, 1910. When operated by accidental grounding of line, will be automatically released.

1,280,783. RING-BACK ARRANGEMENT FOR COMMON-BATTERY TELEPHONE PARTY LINE; Fritz Lubberger, Chicago, Ill. App. filed Sept. 19, 1907. Relates to automatic party-line telephone systems in general, but more particularly to a non-interfering and intercommunicating party-line system.

1,280,806. INDUCTION APPARATUS; Walter S. Moddy, Pittsfield, Mass. App. filed March 23, 1918. More poorly ventilated parts of cores are made up of thinner laminations than better ventilated parts.

1,280,826. CANOPY FIXTURE; Henry T. Paiste, Philadelphia, Pa. App. filed July 24, 1913. May be easily applied to ordinary form of electric wall bracket and designed to receive a contact or attachment plug.

1,280,818. ELECTRIC WELDING APPARATUS; John P. Nikonow, Baltimore, Md. App. filed Oct. 5, 1917. Electrodes of portable apparatus can be manipulated with one hand, closing electric current in one spot on two or more metal sheets and exerting suitable pressure in this spot to produce desired welding action.

1,280,831. VEHICLE-SIGNAL DEVICE; David T. Pitkethly and Henry L. Baier, Brooklyn, N. Y. App. filed Dec. 27, 1915. Comprises plurality of semaphore arms to be displayed in one direction or another to indicate direction of turn.

1,280,832. STARTING AUTOMOBILE VEHICLES; William B. Potter, Schenectady, N. Y. App. filed April 21, 1916. Relates to self-propelled vehicles wherein internal-combustion engine is employed as source of power and electrical apparatus is utilized for propulsion.

1,280,833. CONTROLLING MECHANISM FOR POWER-GENERATING SYSTEMS; William B. Potter, Schenectady, N. Y. App. filed May 17, 1916. When regulator for engine is moved to reduce speed to predetermined value the transmission system is automatically rendered inoperative and battery disconnected from motor in self-propelled vehicle.

1,280,857. ELECTROTHERAPEUTIC APPARATUS; Vern L. Ruiter, Myrtle Creek, Ore. App. filed Oct. 16, 1915. Applies intense dry heat and strong rays of light to limbs.

1,280,867. ELECTRICAL CONNECTION; George L. Scheel, Chicago, Ill. App. filed Nov. 6, 1916. Means of electrically connecting two elements to permit relative rotary movement.

1,280,914. CIRCUIT-CONTROLLING APPLIANCE FOR SERIES INCANDESCENT-LIGHTING SYSTEMS; William C. H. Wefel, Denver, Col. App. filed March 21, 1917. Extinguishment of one or more lamps connected in series in an incandescent lighting system will not affect other lamps.

1,280,955. LIGHTING FIXTURE; Michael B. Bowen, Decatur, Ill. App. filed Jan. 27, 1916. Portable standard for electric lamp engages edge of table, etc.

1,280,969. THROUGH-RINGING AMPLIFIER; Charles S. Demarest, Brooklyn, N. Y. App. filed Oct. 16, 1917. Does not affect balance of repeaters or interfere with transmission.

1,280,982. VENTILATING STORAGE-BATTERY CELLS; Bruce Ford, Philadelphia, Pa. App. filed Feb. 8, 1918. Combination of horizontal cover, pair of vertical baffle plates depending from cover and passages communicating with exterior of cell.

1,280,990. SYSTEM OF CONTROL; Arthur J. Hall, Wilkinsburg, Pa. App. filed June 5, 1916. Relates especially to regenerative control of electric railway motors and like.

1,281,013. INDICATOR AND ALARM; Ira D. Humphreys, Elkville, Ill. App. filed May 23, 1917. Especially applicable to bins to be filled with fine flowing material, it indicates by audible and visual signals when bin is nearly full.

1,281,036. ELECTRIC LIGHTER FOR OXY-ACETYLENE TORCHES; Arthur M. Lofstrom, Cambridge, Minn. App. filed April 17, 1918. Orifice end of torch is separated from one of electrodes connected in circuit while contact is maintained with other, so that jump spark will cause gas to ignite.

1,281,045. SAFETY DEVICE FOR SADIRONS; Richard J. Marshall, Brooklyn, N. Y. App. filed Aug. 24, 1917. Manipulating handle of iron enables iron to be heated or cooled according to will of operator.

1,281,051. ELECTRIC WATER HEATER; Paul Mispel, New Lenox, Mass. App. filed Feb. 9, 1918. For preventing short-circuiting of current and loss of heat from device.

1,281,084. DEMAGNETIZING APPARATUS; Thomas Shaw, Hackensack, N. J., and Clement J. Koukol, Elmhurst, N. Y. App. filed March 4, 1918. For periodically reversing direction of current in circuit and simultaneously reducing strength of said current, whereby magnetized iron cores may be demagnetized.

1,281,085. PROCESS OF MAKING PERMANGANATES; Mark Shoeld, Chicago, Ill. App. filed June 14, 1917. For economical production at minimum expense.

1,281,089. SWITCH; Walter S. Smith, Columbus, Ohio. App. filed July 6, 1915. Requires small amount of energy in its operation and bridges gap in open circuit effectively.

1,281,095. PORTABLE MOVING-PICTURE MACHINE; Frederick C. Taylor, Philadelphia, Pa. App. filed Feb. 27, 1917. Relates to circuit breaker for automatically cutting out motor and shutting off illumination of machine for repairing broken film.

1,281,100. CONTROLLER; John F. Tritle, Schenectady, N. Y. App. filed June 25, 1918. Series-parallel system of control for plurality of series-wound motors.

1,281,106. METER SYSTEM FOR TELEPHONE EXCHANGES; Richard I. Utter, Chicago, Ill. App. filed June 22, 1914. Call is registered whenever plug is inserted into jack at operator's position of trunk circuit.

1,281,112. SPECIAL-SERVICE TRUNK FOR AUTOMATIC TELEPHONE SYSTEMS; Bernard D. Willis, Chicago, Ill. App. filed Oct. 27, 1916. Discriminating test system whereby recording toll operator may be immediately apprised of any limitation on long-distance service of calling line.

1,281,137. AUTOMOBILE SIGNAL; Marvin R. Cole, Stewartsville, N. J. App. filed Aug. 10, 1917. Push-button on steering wheel controls motor-operated signal on rear mud guard.

1,281,139. AIR-SUPPLY HEATER FOR CARBURETORS; Wert D. Colvin and Charles D. Bartholomew, Beardstown, Ill. App. filed March 14, 1918. Assists in vaporizing liquid fuel and consequently increases efficiency of fuel mixture.

1,281,157. FLUID HEATER; William S. Hadaway, Jr., New Rochelle, N. Y. App. filed Jan. 28, 1913. Electric heating units may be removed without dismantling heater, and heater of any desired capacity may be quickly assembled out of units of standard size and shape.

1,281,158. ELECTRIC WATER HEATER; William S. Hadaway, Jr., New Rochelle, N. Y. App. filed Feb. 28, 1914. Heating unit is readily removable for repairs or replacement, while ready access to circuit terminals and switch and means for indicating when heating current is flowing and when it is turned off are provided.

1,281,172. MEANS FOR PROTECTING TIMER WIRES; Arthur S. King, New Hampton, Mo. App. filed Sept. 11, 1916. Especially adapted for protecting timer and wires commonly used on Ford cars from short-circuiting.

1,281,208. ELECTRIC SWITCH; Carl P. Richetelle, New Haven, Conn. App. filed Jan. 13, 1917. Relates particularly to switches of remote-control type and provides safety device to protect switch circuit against fuse blow-outs due to improper use of switch.

1,281,210. AUTOMATIC LIGHT SWITCH; James F. Rippin, Johnstown, Pa. App. filed Dec. 1, 1917. Light of other circuit may be completed or broken by opening door or other swinging member.

1,281,218. RESISTANCE ELEMENT; Edward Schwartz, New York, N. Y. App. filed June 18, 1918. Adapted to be used with hair curlers, drying combs, etc.